Vol. 10. No. 10. pp. 731-816. October, 1940

IMPERIAL MYCOLOGICAL INSTITUTE
7 OCT 1940

THE VETERINARY BULLETIN

1940

WEYBRIDGE:
IMPERIAL BUREAU OF ANIMAL HEALTH
WEYBRIDGE, SURREY
ENGLAND

Price 5/- net

Annual Subscription £2

Imperial Agricultural Bureaux.

EXECUTIVE COUNCIL.

F. J. DU TOIT, *Chairman*	Union of S. Africa.
Dr WILLIAM ALLEN, *Vice-Chairman*	Canada.
Sir DONALD FERGUSSON, K.C.B.	United Kingdom.
F. L. McDOUGALL, C.M.G.	Australia.
NEVILL L. WRIGHT, F.I.C., D.I.C.	New Zealand.
J. M. ADAMS, F.R.C.Sc. (I)	Eire.
D. JAMES DAVIES, C.B.E.	Newfoundland.
SHAMALDHARI LAL, Deputy High Commissioner	India.
B. F. WRIGHT...	Southern Rhodesia.
SHAMALDHARI LAL, Deputy High Commissioner for India ...	Burma.
J. A. CALDER, C.M.G.	Colonies, Protectorates and Mandated Territories.
Sir DAVID CHADWICK, K.C.M.G., C.S.I., C.I.E.	Secretary.

STAFF OF IMPERIAL BUREAU OF ANIMAL HEALTH, WEYBRIDGE.

Director:

W. HORNER ANDREWS, D.Sc., M.R.C.V.S.

Deputy Director and
Editor of The Veterinary Bulletin and of Index Veterinarius:

W. A. POOL, M.R.C.V.S.

Second Officer:

J. TWEEDALE EDWARDS, M.R.C.V.S.

CONTENTS

LIST OF CHIEF SUBJECTS

[Many subjects dealt with are omitted from the list and will be found in the appropriate places. Particular subjects sometimes appear under different headings : *e.g.* Tuberculosis may appear under :— Diseases Caused by Bacteria and Fungi ; Immunity ; Diseases, General (papers on several diseases) ; Public Health ; Therapeutics ; Technique ; Reports and Book Reviews].

	PAGE
DISEASES CAUSED BY BACTERIA AND FUNGI [see also Immunity] ...	731–749
Streptococci	731
Anthrax	732
Tuberculosis	734
Salmonella infection	738
Brucellosis	739
Anaerobic infection	747
DISEASES CAUSED BY PROTOZOAN PARASITES	749–755
Trypanosomiasis	749
Coccidiosis	750
Piroplasmosis	751
DISEASES CAUSED BY VIRUSES ...	755–764
Foot and mouth disease	755
Equine encephalomyelitis	758
Swine fever	759
Rabies	760
Swine influenza	761
Avian virus disease	762
PARASITES IN RELATION TO DISEASE [Arthropods]	764–767
Blowflies	764
Golubatz midge	765
PARASITES IN RELATION TO DISEASE [Helminths]	767–769
IMMUNITY [including Allergic and Serological Diagnosis] ...	769–771
DISEASES, GENERAL [General diseases not dealt with under other headings : Organic Diseases, Miscellaneous Diseases and Neoplasms]	771–783
Poultry diseases	773
Grass sickness	775
Foot rot in sheep	776
Fowl paralysis	781
NUTRITION IN RELATION TO DISEASE [Articles placed in the section " Diseases, General " may also contain references to nutritional factors] ...	783–787
PUBLIC HEALTH	787–790
Milk hygiene	787
Meat hygiene	788
Rat " viruses "	789
THERAPEUTICS	790–796
Sulphamide compounds	790
POISONS AND POISONING ...	796–797
PHYSIOLOGY	797–802
Blood	797
TECHNIQUE AND APPARATUS ...	803–804
MISCELLANEOUS	804–807
REPORTS	807–815
Great Britain	807
India	808
Cyprus	809
Palestine	810
Ceylon	811
Kenya...	811
U.S.A.	813
BOOK REVIEW	815–816

INDEX TO AUTHORS

Accousti, N. J. See Landsberg, J. W., jt. author, 795.
Ackert, J. E, 767.
Adey, C. W., & Kennedy, M., 747.
Alikaev, V. A. See Orlov, N. P., et al., jt. authors, 768.
Anderson, G. W., 739.
Antipin, D. N., 795.
Antoine, C. See Richet, C., jt. author, 749.
Atkeson, F. W. See Whitnah, C. H., et al., jt. authors, 785.

Bacharach, A. L., 787.
—. See also Macfie, J. M., et al., jt. authors, 787.
Bald, J. G. See Dickson, B. T., et al., jt. authors, 755.
Bale, W. F. See Hahn, P. F., et al., jt. authors, 798, *bis*.
Baranov, N., 765.
Barnes, M. F., 739.
Bazeley, P. L., Jakobowicz, R., & Splatt, B., 791.
Bearse, G. E., Miller, V. L., & McClary, C. F., 785.
Beath, O. A., Eppson, H. F., Gilbert, C. S., & Bradley, W. B., 796.
Belschner, H. G., 776.
Benkő, S., 798.
Bero, D. See Hassall, A., et al., jt. authors, 807.
Berry, G. P. See Syverton, J. T., jt. author, 758.
Bessemans, A., Janssens, P., & van Meirhaeghe, A., 749.
Best, R. J. See Dickson, B. T., et al., jt. authors, 755.
Bigger, J. W., Blacklock, J. W. S., & Parish, H. J., 804.
Birch, R. R., 740, 745.
Black, D. A. K., Powell, J., & Witts, L. J., 796.
Blacklock, J. W. S. See Bigger, J. W., et al., jt. authors, 804.
Blakemore, F., 777.
—, & Dalling, T., 782.
Boquet, A., 737.
Bosworth, T. J. See Buxton, J. B., et al., jt. authors, 736.
Boughton, D. C., 751.
Boyarshinov, P. K., 733.
Bradley, W. B. See Beath, O. A., et al., jt. authors, 796.
Brinkhous, K. M. See Knowlton, G. C., et al., jt. authors, 787.
Brit. med. J., 787.
Brooke, W. S. See Wells, A. Q., jt. author, 737.
Bruckner, J. H. See Hutt, F. B., et al., jt. authors, 773.
Bryan, C. S., 788.
Bryan, W. L. See Mason, K. E., jt. author, 786.
Buck & Metzger, 752.
Buck, G., 752.
Buck, S. C. See May, H. B., jt. author, 790.
Buckley, S. S. See McPhee, H. C., jt. author, 779.
Bull. agric. Congo belge, 805.
Burn, C. G. See Liebow, A. A., et al., jt. authors, 736.
Burnet, F. M., Freeman, M., Jackson, A. V., & Lush, D., 771.
—. See also Dickson, B. T., et al., jt. authors, 755.
Burschkies, K. See Rothermundt, M., jt. author, 792.
Bushnell, L. D., & Twiehaus, M. J., 773.
Buxton, J. B., Glover, R. E., Dalling, T., & Bosworth, T. J., 736.

Card, L. E. See Roberts, E., et al., jt. authors, 739.
Carson, G. B. See Hassall, A., et al., jt. authors, 807.
Cave, H. W. See Whitnah, C. H., et al., jt. authors, 785.
Ceylon, 811.
Chance, M. R. A. See Macfie, J. M., et al., jt. authors, 787.
Christiansen, M. J. See Jepsen, A., jt. author, 788.
Cole, R. K. See Hutt, F. B., et al., jt. authors, 773.
Coles, J. D. W. A., 753.
Collins, F. V., 788.
Colony & Protectorate of Kenya, 811.
Corner, H. H. See Morgan, D. O., jt. author, 768.
Corwin, G. E., 740.
Cotton, W. E., 739.
Crawford, M., 811.
Cruickshank, J. C., 790.
Curnen, E. C. See MacLeod, C. M., et al., jt. authors, 806.
Cutting, W. C. See van Winkle, W., Jr., jt. author, 792.
Cyprus, 809.

Dalling, T. See Blakemore, F., jt. author, 782.
—. See also Buxton, J. B., et al., jt.authors, 736.
Damerow, A. P., 737.
Daubney, R., 811.
van Deinse, F., 735.
Dekaris, V., 734.
Deubler, E. C., 739.
Dick, A. T., 800.
Dickson, B. T., Bald, J. G., Burnet, F. M., Gregory, T. S., Best, R. J., Lush, D., Priestley, H., Young, W. J., Mackerras, I. M., Rubbo, & Prescott, J. A., 755.
Dinulesco, G., 765.
—. See also Ionesco-Braila, G., jt. author, 765.
Dobson, N., 762.
Donatien, A., & Lestoquard, F., 761.
Donham, C. R. See Edgington, B. H., jt. author, 744.
Doss, M. A. See Hassall, A., et al., jt. authors, 807.
Dubois, A., 754.
—, & Kohn, I., 792, 793.
—, & Losner, S., 793.
Dubos, R. J., 806.
Duckworth, C. U., 814, *bis*.
DuFour, E. H. See Seibert, F. B., jt. author, 770.
Dumaresq, J. A. See Philp, R. C. T., et al., jt. authors, 784.
Duncan, C. W., Lightfoot, C. C., & Huffman, C. F., 797.
Durant, A. J., & McDougle, H. C., 782.

Eccles, A., 755.
Eden, A., 800, 805.
Edgington, B. H., & Donham, C. R., 744.
Egorov, I. A., 733.
Elkington, G. W., Wilson, G. S., Taylor, J., & Fulton, F., 788.
Ellis, N. R., & Madsen, L. L., 784.
Elvehjem, C. A. See Frost, D. V., jt. author, 786.
Eppson, H. F. See Beath, O. A., et al., jt. authors, 796.
Essex, H. E. See Hester, H. R., et al., jt. authors, 802.
Evans, B. See Hanks, J. H., jt. author, 771.

Farr, M. M. See Hassall, A., et al., jt. authors, 807.
Faure, 732, 795.
Fearon, W. R., 815.
Ferwerda, S. See Tenhaeff, C., jt. author, 767.
Fincher, M. G., & Hayden, C. E., 795.
Fomina, A. Y., 759.
Forrester, J. S., & Langner, P. H., Jr., 803.
—. See also Langner, P. H., Jr., jt. author, 803.
Fourie, P. J. J., 778.
Freeman, M. See Burnet, F. M., et al., jt. authors, 771.
Friedheim, E. A. H., 793.
Friesen, A., 787.
Frost, D. V., & Elvehjem, C. A., 786.
Fulton, F. See Elkington, G. W., et al., jt. authors, 788.

Gerlach, F., 756.
Gilbert, C. S. See Beath, O. A., et al., jt. authors, 796.
Giltner, W., 815.
Givens, H. C., 739.
Glover, R. E. See Buxton, J. B., et al., jt. authors, 736.
Goetchius, G. R. See Olsen, C., jt. author, 738.
Goettsch, M. See Pappenheimer, A. M., et al., jt. authors, 786.
Goncharov, N. P., 759.
Gordon, W. S. See Stewart, J., et al., jt. authors, 775.
Grabar, P. See Levenson, S., jt. author, 748.
Graf, 802.
Great Britain, 807, *bis*.
—. Rep. med. Res. Coun., 1938-39, 807.
Gregory, T. S., 776.
—. See also Dickson, B. T., et al., jt. authors, 755.
Grieder, H., 769.
Gur'eva, A. M. See Orlov, N. P., et al., jt. authors, 768.
Gwatkin, R., 759.
Hahn, P. F., Bale, W. F., Hettig, R. A., Kamen, M. D., & Whipple, G. H., 798.
—, Ross, J. F., Bale, W. F., & Whipple, G. H., 798.
Halberstaedter, L., 749.
Hanks, J. H., & Evans, B., 771.
Hardenbergh, J. G., 740.
Hart, L. See Hungerford, T. G., jt. author, 763.
Hassall, A., Doss, M. A., Farr, M. M., Carson, G. B., & Bero, D., 807.
Hawking, F., 749.
Hayden, C. E. See Fincher, M. G., jt. author, 795.
Henderson, 804.
Herrick, C. A., 750.
Hester, H. R., Essex, H. E., & Mann, F. C., 802.
Hettig, R. A. See Hahn, P. F., et al., jt. authors, 798.
Hines, H. M. See Knowlton, G. C., et al., jt. authors, 787.
Hoare, C. A., 750.
Holman, H. H., 775.
Holth, H., 777.
Howe, J. S., 735.
Huffman, C. F. See Duncan, C. W., et al., jt. authors, 797.
Hughes, J. S. See Peterson, W. J., jt. author, 785.
Hungerford, T. G., & Hart, L., 763.
Hutt, F. B., Bruckner, J. H., & Cole, R. K., 773.

India, 760, 808.
—. Rep. Imp. Coun. agric. Res., 1938-39, 808.
Ionesco-Braila, G., & Dinulesco, G., 765.

Jackson, A. V. See Burnet, F. M., et al., jt. authors, 771.
Jackson, C. See Steyn, H. P., et al., jt. authors, 778.
Jacobs, J. L., & Sommers, S. C., 770.
Jadin, J., 750.
Jakobowicz, R. See Bazeley, P. L., et al., jt. authors, 791.
Janjua, N. A., 764.
Janssens, P. See Bessemans, A., et al., jt. authors, 749.
Jármai, K., 783.
Jepsen, A., & Christiansen, M. J., 788.
Jerlov, S., 734.
Johnson, E. P., 781.
J. R. agric. Soc., 766, 807.

Kamen, M. D. See Hahn, P. F., et al., jt. authors, 798.
Karsubova, C. See Pappenheimer, A. M., et al., jt. authors, 786.
Kast, G., 732.
Kennedy, M. See Adey, C. W., jt. author, 747.
Knipling, E. F., 764.
Knowlton, G. C., Hines, H. M., & Brinkhous, K. M., 787.
Kohn, I. See Dubois, A., jt. author, 792, 793.
Korovetskaya, N. N., 779.
Krembs, J., 779.
Kress, F., 778.
Kühbacher, H., 794.

Lancet, 787, 790.
Landsberg, J. W., & Accousti, N. J., 795.
Langner, P. H., Jr., & Forrester, J. S., 803.
—. See also Forrester, J. S., jt. author, 803.
Larrat, M., 805.
Lavrent'ev, P. A., 753.
Legg, J., 751.
Lestoquard, F. See Donatien, A., jt. author, 761.
Levenson, S., & Grabar, P., 748.
Levine, P. P., 794.
Lichtenstein, M., 796.
Liebow, A. A., Burn, C. G., & Soper, W. B., 736.
Lightfoot, C. C. See Duncan, C. W., et al., jt. authors, 797.
Losner, S. See Dubois, A., jt. author, 793.
Lush, D. See Burnet, F. M., et al., jt. authors, 771.
—. See also Dickson, B. T., et al., jt. authors, 755.
Luy, P., 802.

Maas, 757.
McCallum, J. W. See Stewart, J., et al., jt. authors, 775.
McClary, C. F. See Bearse, G. E., et al., jt. authors, 785.
McDougle, H. C. See Durant, A. J., jt. author, 782.
Macfie, J. M., Bacharach, A. L., & Chance, M. R. A., 787.
Mackerras, I. M. See Dickson, B. T., et al., jt. authors, 755.
MacLeod, C. M., Mirick, G. S., & Curnen, E. C., 806.
McPhee, H. C., & Buckley, S. S., 779.
Madden, S. C., & Whipple, G. H., 797.
Madsen, D. E. See Nielsen, H. M., jt. author, 784.
Madsen, L. L. See Ellis, N. R., jt. author, 784.
Malbrant, R., 772.
Mann, F. C. See Hester, H. R., et al., jt. authors, 802.
Marble, D. R., 773, 774.
Marcusson, E., 744, *bis*.
Marek, J., Wellmann, O., & Urbányi, L., 784.
Mason, K. E., & Bryan, W. L., 786.
May, H. B., & Buck, S. C., 790.
Medlar, E. M., 734.
van Meirhaeghe, A. See Bessemans, A., et al., jt. authors, 749.
Metzger. See Buck, jt. author, 752.
Metzger, H. J., & Morrison, H. B., 783.
Miles, A. A., & Pirie, N. W., 746.
—, —, & Philpot, J. St. L., 746.
Miller, V. L. See Bearse, G. E., et al., jt. authors, 785.
Mirick, G. S. See MacLeod, C. M., et al., jt. authors, 806.
Mochida, I., 738.
Möhlmann, H., 757.
Morgan, D. O., & Corner, H. H., 768.
Morrison, H. B. See Metzger, H. J., jt. author, 783.
de Moulin, F. W. K., 748.

Nielsen, H. M., & Madsen, D. E., 784.
Nisi, T., 731.

Olitsky, P. K., 763.
Olson, C., & Goetchius, G. R., 738.
Orlov, N. P., Alikaev, V. A., Prieselkov, A. M., Rodionov, V. G., Gur'eva, A. M., & Samartsev, A. S., 768.
Ortlepp, R. J., 768.
Oswald, B., 767.

Pappenheimer, A. M., Goettsch, M., & Karsubova, C., 786.
Paranjothy, J. T., 789.
Parish, H. J. See Bigger, J. W., et al., jt. authors, 804.
Pennington, D. See Snell, E. E., et al., jt. authors, 786.
Peterson, W. J., & Hughes, J. S., 785.
—. See also Whitnah, C. H., et al., jt. authors, 785.
Pfaff, G., 758.
Philipsz, G. L. C. See Veeraraghavan, N., jt. author, 760.
Philp, R. C. T., Dumaresq, J. A., & Wilson, R. J., 784.
Philpot, J. St. L. See Miles, A. A., et al., jt. authors, 746.
Piasecka-Zeyland, E., 737.
Pierpont, R. L., 794.
Pirie, N. W. See Miles, A. A., jt. author, 746.
—. See also Miles, A. A., et al., jt. authors, 746.
Porter, J. R., & Rettger, L. F., 784.
Powell, J. See Black, D. A. K., et al., jt. authors, 796.
Prescott, J. A. See Dickson, B. T., et al., jt. authors, 755.
Prieselkov, A. M. See Orlov, N. P., et al., jt. authors, 768.
Priestley, H. See Dickson, B. T., et al., jt. authors, 755.
Purchase, H. S., 781.

Quinlan, J. See Steyn, H. P., et al., jt. authors, 778.

Raevskiĭ. See Uspenskiĭ, et al, jt. authors, 733.
Rajčević, M., 772.
Ray, J. D., & Whipple, G. E., 760.
Rep. Calif. Dep. Agric. 1936, 814.
Rep. Calif. Dep. Agric. 1937, 814.
Rep. Conf. Bang's Dis. N. Atlantic States, 1937, 739, *sept.* 740, *quin.*
Rep. Dep. Agric. Palestine, 1938-39, 810.
Rep. Surg. Gen. U. S. Army, 1939, 813.
Rettger, L. F., 740.
—. See also Porter, J. R., jt. author, 784.
Richet, C., & Antoine, C., 749.
Rider, J. R., 769.
Riedmüller, L., 777.
Rittenberg, D. See Schoenheimer, R., jt. author, 799.
Roberts, E., Severens, J. M., & Card, L. E., 739.
Rodionov, V. G. See Orlov, N. P., et al., jt. authors, 768.
Roe, R. J., 809.
Roets, G. C. S., 752.
Roos, J., 789.
Rosenbusch, C. T., & Shope, R. E., 761.
Ross, J. F. See Hahn, P. F., et al., jt. authors, 798.
Rothermundt, M., & Burschkies, K., 792.
le Roux, G., 759.
Rubbo. See Dickson, B. T., et al., jt. authors, 755.

Sählstedt, V., 803.
Sályi, G., 756.
Samartsev, A. S. See Orlov, N. P., et al., jt. authors, 768.
van der Schaaf, A., 746.
Schoch, A., 762.
Schoenheimer, R., & Rittenberg, D., 799.
Schoening, H. W., 758.
Schroeder, F., 777.
Schulz, K., 754.
Schulze, H. G., 780.
Seibert, F. B., & DuFour, E. H., 770.
Severens, J. M. See Roberts, E., et al., jt. authors, 739.
Seyfarth, M., 778.
Shah, S. M. A., 804.
Shillinger, J. E., 774.
Shope, R. E., 761, *bis*, 771.
—. See also Rosenbusch, C. T., jt. author, 761.
Singh, B., 757.
Smith, J. M., 810.
Smith, R. W., 739.
Snell, E. E., Pennington, D., & Williams, R. J., 786.
Sokhey, S. S., 760.
Sommers, S. C. See Jacobs, J. L., jt. author, 770.
Soper, W. B. See Liebow, A. A., et al., jt. authors, 736.
Southall, J., 804.
Splatt, B. See Bazeley, P. L., et al., jt. authors, 791.
Stewart, D. F., 731.
Stewart, J., Gordon, W. S., & McCallum, J. W., 775.
Steyn, D. G., 796.
Steyn, H. P., Quinlan, J., & Jackson, C., 778.
Strong, R. P., 753.
Syverton, J. T., & Berry, G. P., 758.
Szundy, L., 783.

Taylor, E. L., 769.
Taylor, J. See Elkington, G. W., et al., jt. authors, 788.
Tenhaeff, C., & Ferwerda, S., 767.
Toupaitch, M., 765.
Trum, B. F., 795.
Twiehaus, M. J. See Bushnell, L. D., jt. author, 773.

United States of America, 813, 815.
—. Proc. N. Cent. States Bang's Dis. Cong., 1938, 743.
—. Rep. Conf. Bang's Dis. N. Atlantic States, 1937, 739.
Urbányi, L. See Marek, J., et al., jt. authors, 784.
Uspenskiĭ, Raevskiĭ, & Voskresenskiĭ, 733.

Veeraraghavan, N., & Philipsz, G. L. C., 760.
de Villiers, O. T., 801.
Voskresenskiĭ. See Upsenskiĭ, et al., jt. authors, 733.

Wagener, K., 781.
Wellmann, O. See Marek, J., et al., jt. authors, 784.
Wells, A. Q., & Brooke, W. S., 737.
Whipple, G. E. See Ray, J. D., jt. author, 760.
Whipple, G. H. See Hahn, P. F., et al., jt. authors, 798, *bis*.
—. See also Madden, S. C., jt. author, 797.
Whitnah, C. H., Peterson, W. J., Atkeson, F. W., & Cave, H. W., 785.
Wight, A. E., 739.
Williams, R. J. See Snell, E. E., et al., jt. authors, 786.
Wilson, G. S. See Elkington, G. W., et al., jt. authors, 788.
Wilson, R. J. See Philp, R. C. T., et al., jt. authors, 784.
van Winkle, W., Jr., & Cutting, W. C., 792.
Winterhalter, M., 772, *ter*.
Wisnicky, W., 740.
Witts, L. J. See Black, D. A. K., et al., jt. authors, 796.
Woods, D. D., 790.

Young, W. J. See Dickson, B. T., et al., jt. authors, 755.

Zaharija, I., 745.
Zarubkinskiĭ, V. S., 746.
Željko, M., 760.

NEW ZEALAND.

Applications are invited for the position of Senior Veterinary Research Officer, Ruakura Animal Research Station, Hamilton. Salary according to qualifications and experience £615/715 (New Zealand currency). For further particulars apply to the High Commissioner for New Zealand, 415, Strand, London, W.C.2, by whom completed applications will be received up to the 19th October, 1940.

Bulletins on disease subjects written for farmers and "popular" articles of a similar nature are not included in the *Veterinary Bulletin*. Those of a sufficiently important nature, are, however, included in *Index Veterinarius*; so also are certain review articles, presidential addresses, congress proceedings, etc., where the title conveys as much information as could be given in an abstract of a few lines. For information of this nature, readers of the *Veterinary Bulletin* are referred to *Index Veterinarius*, where titles of all publications indexed by the bureau are fully cross-referenced.

The Editor will be glad to receive publications relating to Veterinary Science and cognate subjects in order that they may be dealt with in the *Veterinary Bulletin*.

Reports of Departments, Special Reports, reprints, etc., etc., should be sent as soon as they are issued.

Books for Review.

The Editor will be glad to receive books for review in the *Veterinary Bulletin*.

INDEX VETERINARIUS.

See notice on page 3 of cover.

IMPERIAL BUREAU OF ANIMAL HEALTH

THE

VETERINARY BULLETIN

Vol. 10.] October, 1940. [No. 10.

DISEASES CAUSED BY BACTERIA AND FUNGI

STEWART, D. F. (1938). **The Serological Types of Group-B Streptococci (Str. agalactiae) Isolated from Individual Herds in New South Wales.**—*Aust. vet. J.* **14.** 247–251. [7 refs.]

175 strains of group B streptococci were isolated from milk samples taken from each quarter of 282 cows comprising seven herds situated in widely separated localities in New South Wales. The strains were examined serologically by means of the slide agglutination and absorption tests. It was found that in any one herd the majority of strains isolated were of the same main serological type, although they varied in some cases in their subtype behaviour. This predominance was more marked in moderately affected herds than in heavily affected herds. In 29 of 43 cows which were affected in more than one quarter, the same type was found in each quarter, but dissimilar types were found in the remaining 14 cows. These results are in general agreement with STABLEFORTH's results and support the contention that streptococcic mastitis is a contagious disease.—W. I. B. BEVERIDGE.

NISI, T. (1939). **On the Comparative Studies of Biological Characters between Equine and Human Haemolytic Streptococci.**—*Jap. J. vet. Sci.* **1.** 184–203. 3 tables. [Numerous refs.] [In Japanese: abst. from English summary].

Forty equine strains of *Str. haemolyticus* and 19 human pathogenic streptococci were studied in an attempt to differentiate equine and human strains and to differentiate the types of equine strains.

Tests for final pH in glucose broth, methylene blue reduction, haemolysis and resistance to heat gave inconclusive results. Sugar fermentation tests and Watanabe's antifluorescence phenomenon were also studied. (To demonstrate the latter a mixture of *Salmonella cholerae-suis* and streptococci is grown for 20 hours on a serum agar plate. Growth of *S. cholerae-suis* is opaque and fluorescent. Small, round, translucent and non-fluorescent plaques occur surrounding the colonies of haemolytic streptococci. Two types of non-fluorescent zones are seen, one being weakly positive and the other strongly positive. Not all haemolytic streptococci produce this effect on salmonella colonies).

The table shows the types of streptococci differentiated.

Strains	No.	Trehalose	Sorbitol	Lactose	Watanabe Test
Equine strains	27	—	+	+	+
,, ,,	9	+	—	—	++
,, ,,	2	—	—	—	—
,, ,,	1	+	—	+	
,, ,,	1	—	—	+	
Human ,,	19	+	—	+	—

[The above results should be compared with those of Evans and Verder (*V. B.* **10.** 231). In the absence of any serological classification of the streptococci, it is difficult to assess the value of Watanabe's phenomenon as an aid to classification.]
—John Francis.

Faure. (1939). Considérations sur les épizooties charbonneuses observées dans le Sud Marocain (Bou Izakareu). [**Anthrax Epizootics in South Morocco**]. —*Maroc méd.* **19.** 353–356. 1 fig. [1 ref.]

Outbreaks of anthrax which occurred in both animals and man in south Morocco during the years 1936–1938 are described, details being given of the human cases. F. expresses the view that the outbreaks were largely due to the neglect, especially amongst the nomadic tribes, of the proper disposal of the carcasses of animals, and suggests that stricter and more drastic methods of control should be adopted.—J. R. Lawson.

Kast, G. (1938). Untersuchungen über das Vorkommen und über die Abtötung von Milzbrandsporen bei der Einbadchromgerberei. [**The Destruction of Anthrax Spores in the Single-Bath Chrome Tanning Process**].—*Münch. tierärztl. Wschr.* **89.** 205–209, 217–221, 231–235 and 253–257. Numerous tables. [Numerous refs.]

K. states that nearly all imported hides, especially those from the South American countries, China, South Africa, Australia, India and the Dutch East Indies, collected through the ordinary trade channels in those countries and not from abattoirs, are to be regarded as probably infected. He gives a detailed description of hides from these countries and their trade names. He reviews methods of diagnosis and disinfection, and comes to the conclusion that most disinfectants are ineffective or spoil the hides. He describes at length different tanning processes, particularly chrome-tanning. He reports that in one test of a so-called "soft-water" sample from the first stage in the tanning process, a colony of virulent anthrax bacilli was found. In the residue of the following stages no anthrax organisms could be found. The chemical used for removing the hairs and epidermis consists of a mixture of calcium hydroxide and sodium monosulphide or calcium hydroxide and arsenic disulphide. Anthrax spores inoculated into these mixtures were killed within 35–43 days, but more readily in the supernatant fluid than in the sediment. Chrome-alum takes 27 days to kill the organisms. None of the usual chemicals is effective for the destruction of anthrax spores within the time allocated to each particular phase in the tanning process, but the different successive stages collectively may give a sufficient sterility by the end of the tanning process. It is most important to disinfect the water used in the preliminary washing process, as anthrax spores are always likely to be present.—M. F. Benjamin.

I. Boyarshinov, P. K. (1939). Trebovaniya k kamere dlya dezinfektsii sibireyazvennogo kozhsyr'ya pikelevaniem. [**Construction and Organization of Stations for the Disinfecting of Anthrax-Infected Hides**].—*Sovyet. Vet.* No. 2. pp. 44–47. 5 figs.

II. Egorov, I. A. (1939). Dezinfektsiya zarazhennoĭ sibirskoĭ yazvoĭ apparatury na kozhevennykh zavodakh. [**Disinfection of Anthrax-Infected Equipment in Leather Factories**].—*Ibid.* pp. 48–51. 1 table.

III. Uspenskiĭ, Raevskiĭ, & Voskresenskiĭ. (1939). Dezinfektsiya pikelevaniem (Schattenfroh) mekhsyr'ya, zarazhennogo sibirskoĭ yazvoĭ. [**Disinfection of Anthrax-Infected Furs by the Schattenfroh Method**].—*Ibid.* pp. 52–54. 1 table.

I. A detailed description of a model disinfecting plant with diagrams and figures illustrating its equipment, layout, organization and operation.

The plant is divided into clean and contaminated sections which are so laid out that direct contact is avoided ; the staff may not enter or leave the contaminated section without taking suitable precautionary measures. Protective clothing consisting of overalls, rubber boots, a hood and gloves is worn.

While other devices are mentioned, the apparatus recommended for disinfection is a wooden drum 6 ft. in diameter and 3 ft. in width, with an opening on both sides (the hides ought first of all to be soaked to soften them). The drum is built into the wall separating the clean and contaminated sections and is accessible from both these. It revolves around a horizontal axis, the rate recommended being 8–12 revolutions per minute. The dimensions quoted for the drum permit the simultaneous disinfection of 10–12 heavy hides, weighing altogether about 450 lb.

The same drum can be used for the preliminary soaking of the hides. In the clean section a drum similar to the disinfecting drum, but with only one opening, should be provided for the neutralizing of the hides after disinfection.

Provision is also made for the daily disinfection of the protective clothing worn by the staff and for the safe disposal of all effluents.

After this treatment the hides are washed in a tank provided for the purpose.

II. E. points out that despite the action of mechanical, thermal and chemical agents used in the processing of leather, anthrax spores survive and remain virulent in the equipment of leather factories, where they can contaminate products and effluents and infect workers.

E. criticizes the Russian official instructions issued for the disinfection of the machinery and premises of leather factories on the grounds that they recommend the indiscriminate use of chloride of lime, not taking into account the fact that some of the agents used have a strong affinity for chlorine and others may liberate it.

The use of chloride of lime (freshly prepared in a concentration of 10 %) is recommended only for the appliances used in soaking. Caustic soda of the same concentration is recommended for appliances used in liming, dyeing, drying and finishing departments, and a similar dilution of commercial hydrochloric acid for those used in the pickling process. For the equipment used in tanning departments either alkali or acid can be used with equal effect.

These 10 % concentrations were tested on equipment artificially contaminated with a considerable number of spores from a resistant anthrax strain, and should, therefore, be regarded as upper limits. In practice lower concentrations would probably suffice, but until there is experimental corroboration of this, safety demands adherence to these values.

III. Experiments regarding the applicability to furs of the Schattenfroh method of disinfection showed no deterioration in the fur after treatment according to this method, and the authors state that it is suitable for general adoption in the fur industry.—E. Martin.

DEKARIS, V. (1939). Morfološka i biokemijska diferencijacija b. anthracis-a i b. pseudanthracis-a. [**Morphological and Biochemical Differentiation of** *Bacillus anthracis* **and** *B. pseudoanthracis*].—*Jugoslov. vet. Glasn.* **19.** 399–406. 4 figs., 2 tables. [9 refs.] [French summary].

From the results of experience in the microscopic diagnosis of anthrax in the course of which *B. pseudoanthracis* and not *B. anthracis* was detected many times, D. formed the opinion that it was easy to make a false positive diagnosis. He investigated, therefore, cultural methods of differentiation of the two organisms and found that a potato medium was useful. After 24 hours of incubation at 37°C., cultures of *B. anthracis* are white and those of *B. pseudoanthracis* are brownish-yellow. On transfer into Zeissler's plates, *B. anthracis* causes haemolysis after 48 hours whilst *B. pseudoanthracis* causes haemolysis within 16 hours. Differentiation between these organisms by examination for capsule and for motility is discussed.—B. OSWALD (NOVI, YUGOSLAVIA).

MEDLAR, E. M. (1940). **Pulmonary Tuberculosis in Cattle. The Location and Type of Lesions in Naturally Acquired Tuberculosis.**—*Amer. Rev. Tuberc.* **41.** 283–306. 4 figs., 4 tables. [8 refs.]

This is a statistical analysis of the type and distribution of over 2,000 lesions from 520 pairs of tuberculous bovine lungs. As a result of the TB. eradication programme in the U.S.A. and Canada, tuberculous material from cattle is scarce, and tuberculous lungs were collected from New York, Montreal and Toronto through the co-operation of three large meat packing corporations, and probably represent a fair sample of bovine pulmonary tuberculosis over a wide area in which dairy farming is a major industry.

It was found that both lungs were equally involved, due regard being paid to the greater volume of the right lung and the peculiar anatomical position of its anterior lobe. The distribution of changes in lungs with single and multiple lesions clearly indicated air-borne infection. The greater frequency per unit volume of tuberculous foci in certain areas of lung parenchyma cannot be satisfactorily explained on a basis of the mechanics of respiration ; it is suggested that postural influences may play a part. Tuberculosis of the bronchial mucosa is considered to be due to implantation and not to haematogenous infection ; the lesions were usually directly related to the drainage from a cavitating lesion.—E. G. WHITE.

JERLOV, S. (1940). Den direkta mikroskopiska diagnosen av smitfarlig lungtuberkulos och dess överensstämmelse med de patologisk-anatomiska förändringarna. [**Direct Microscopic Diagnosis of Open Tuberculosis and its Comparison with Pathological Findings**].—*Beretn. 5. nord. Vet.-møde, Kbh., 1939.* pp. 180–202. 10 figs. Discussion pp. 203–218. [French summary].

In Sweden, where special attention is paid to the elimination of cases of open TB. in cattle, it is prescribed by law that animals judged on the basis of clinical and microscopic diagnosis to be so affected, must be slaughtered and examined P.M. by a veterinary meat inspector within 30 days, records being kept by which the diagnosis verdicts may be compared with P.M. findings.

J. gives the results of such work on 300 cattle which he judged to be tuberculous by clinical examination and by the results of examining bronchial mucus smears. His results are described in four groups depending on the degree of lung lesion found P.M. In general the *ante-mortem* diagnosis agreed closely with the P.M. findings, but in 25 cases no lung lesion was found P.M. at the abattoir. On closer examination at J.'s laboratory, small tuberculous foci were, however, found in the

lungs of 22 of these animals. The conclusion is drawn that the above microscopic method of diagnosis is very reliable for the diagnosis of open pulmonary TB. in cattle.

During the discussion WALL gave an illustrated account of the morphology of bovine lungs and pointed out the common sites of tuberculous foci therein. He also described the formation of the primary TB. focus in the alveolus and stated that its presence could be detected in its earliest stage by a characteristic small piping sound audible on auscultation: infected cattle should be detected and removed when at this early stage.

CHRISTENSON made suggestions for improving bovine TB. control in Sweden: these called for identification marks for reacting cattle, an increase in state financial support, the appointment of more whole-time veterinarians for TB. control, special courses of instruction for veterinary practitioners, research on the possible deleterious effect on cattle of tuberculin [see MARCUSSON (*V. B.* **10.** 686.)] and closer co-operation between the medical and veterinary workers on TB.—J. E.

HOWE, J. S. (1939). **Periodicity of Sporadic Bacillemia in Experimental Tuberculosis in Dogs.**—*Proc. Soc. exp. Biol., N.Y.* **41.** 575–577. 3 figs. [3 refs.]

Twelve dogs were injected intravenously or subcutaneously with 3–20 mg. of a human strain of the tubercle bacillus, suspended in kaolin, mineral oil and normal saline. 3–5 c.c. of blood, taken aseptically each day from the femoral artery, were injected subcutaneously into g. pigs. These were tuberculin tested before inoculation and thereafter at intervals until P.M. examination after three months. The presence of tuberculosis was diagnosed by tuberculin test results and by microscopic examination for tubercle bacilli of smears from lesions. Three charts show that there was a tendency to periodicity of bacillaemia in these dogs. It appeared to be independent of the duration and result of the infection and of the distribution of the lesions. H. attributed this periodicity to some factor affecting all the animals in the same manner at about the same time.—R. O. MUIR.

VAN DEINSE, F. (1939). Comportement des lapins inoculés à plusieurs reprises avec des bacilles tuberculeux aviaires morts éprouvés par des bacilles aviaires vivants. [**Behaviour of Rabbits Inoculated Many Times with Dead Avian Tubercle Bacilli, Tested by Live Avian Bacilli**].—*Ann. Inst. Pasteur.* **63.** 554–568. [13 refs.]

Twelve examples are described of the result of intravenous inoculation of rabbits with 0·1–1·0 mg. of live, avian tubercle bacilli at varying intervals after vaccination by three intravenous injections, at five-day intervals, of 1·0 mg. of avian bacilli, killed by exposure to 70°C. for one hour. Certain rabbits which were injected with live bacilli before a sufficiently intense allergic state had developed, died, in about the same time as the unvaccinated control rabbits, of the Yersin type of toxic infection, numerous bacilli being present in the organs. Other rabbits, tested after a longer interval when the allergic state was at a maximum, died, in a much shorter time than the control rabbits, of a hyperacute Yersin type of toxic infection, relatively few bacilli being present in the organs. A third group of rabbits tested after at least 60 days, when they were becoming gradually desensitized by the diffusion of excess of protein from the foci of dead bacilli, died after several weeks of caseating tuberculosis. A fourth category, injected with live bacilli several months after vaccination, when desensitization was complete, died in an emaciated condition after prolonged disease, showing at autopsy only arthritic lesions or a few retrogressive nodules in the organs.—R. O. MUIR.

LIEBOW, Averill A., BURN, C. G., & SOPER, W. B. (1940). **BCG Immunization. A Comparison of the Effects of BCG and of Heat-Killed Organisms on the Course of a Subsequent Infection with Virulent Tubercle Bacilli in the Guinea Pig.**—*Amer. Rev. Tuberc.* **41.** 592–604. 4 tables, 1 chart. [Numerous refs.] [Authors' summary copied *verbatim*].

The influence of injections of heat-killed " S " and " R " tubercle bacilli injected intramuscularly, and of BCG injected subcutaneously and intracutaneously on the course of a subsequent infection with virulent tubercle bacilli was studied in the guinea pig under controlled conditions.

A definite degree of protection was observed in animals receiving BCG, as judged by the lower incidence and lesser amount of tuberculosis, later appearance of lesions, and longer period of survival as compared with the controls. Heat-killed " S " bacilli were only slightly protective and the " R " organisms not at all. Not only was there no gross tuberculosis observed in many of the BCG animals, but some showed decreasing sensitivity to tuberculin with passage of time despite the injection of virulent organisms.

The incidence of intercurrent infection during and immediately after the period of vaccination was definitely greater in the animals receiving heat-killed organisms than in the BCG animals and controls.

BUXTON, J. B., GLOVER, R. E., DALLING, T., & BOSWORTH, T. J. (1939). **Duration of Immunity Induced in Calves by BCG.**—*J. comp. Path.* **52.** 273–300. 7 tables, 3 charts. [7 refs.]

The experiments described fall into three groups. In the first group ten calves each received a preliminary dose of 100 mg. BCG by intravenous injection. There were two controls and all the animals were maintained in rigid isolation. At intervals of six months, reinforcing doses of 50–100 mg. of vaccine were administered. Three years after the commencement of the experiment, each animal received *per os* an infecting dose of 5 mg. of virulent bovine tubercle bacilli in 3 c.c. normal saline. In addition close contact was permitted with animals known to be infected with TB. On autopsy six months later five of the animals were found to have been completely protected. Three showed slight infection. The remaining two died early in the experiment and were discarded. They had not received an infecting dose.

In the second group 20 calves were vaccinated as before, but received the infecting dose after an interval of only two months. Vaccination and reinfection were repeated every six months for three years, when autopsies were performed. There were ten controls, and all animals were maintained throughout on infected premises. In this group there was no evidence that vaccination had afforded protection.

In the third group ten calves were vaccinated. There were five controls. Vaccination was repeated three times at intervals of six months. During this period the animals were maintained in strict isolation. The infecting dose was then administered and all animals were allowed to mix freely with known cases of disease. During the succeeding 18 months three vaccinations and three experimental infections were given. P.M. there was evidence of only slight resistance in the vaccinated animals.

Tuberculin tests were made throughout the work. Marked fluctuations were observed during vaccination. In the early stages skin sensitivity was augmented, but successive doses of vaccine decreased reactions. A number of no-lesion reactors was noted. In most of these virulent bacilli were demonstrated P.M. by g. pig inoculation.—D. D. OGILVIE.

DAMEROW, A. P. (1940). **The Immunizing Property of Heat-Killed Tubercle Bacilli.**—*Amer. Rev. Tuberc.* **41.** 512–518. 2 figs., 2 tables. [14 refs.] [Author's summary copied *verbatim*].

1. Heat-killed, as compared with viable avirulent human tubercle bacilli do not produce an efficient specific immunity against virulent experimental infections in guinea pigs.

2. The slight retarding effect upon virulent infection produced by heat-killed tubercle bacilli in guinea pigs depends upon whether the bacilli are suspended in weak alkali (sodium bicarbonate or sodium carbonate) or in weak acid (hydrochloric acid). The acid suspensions in contrast to the alkaline show an enhancing effect upon the virulent infection.

PIASECKA-ZEYLAND, E. (1939). **An Investigation of the Value of Various Media for the Primary Culture of Tubercle Bacilli from Tuberculous Material.**—*Tubercle, Lond.* **21.** 56–61. 2 tables.

Tubercle bacilli were cultured from five tuberculous human sputa and five bovine organs on series of ten tubes of each of three egg media—Petragnani's, Dorset's, and egg-yolk medium inspissated after the addition of 1 part of saline to two parts of yolk. Glycerin, " virgin " wax or malachite green was added to each of the three media, and the effects on growth noted. Colonies were obtained on all the media from TB. material treated before inoculation with 20% sulphuric acid, but they grew faster and were more numerous if the acid-treated material was first neutralized. All three egg media gave similar final cultural results, although colonies first appeared on Petragnani's medium. Malachite green inhibited the growth of contaminants and favoured the detection of colonies of tubercle bacilli by colour contrast. The accelerating action of " virgin " wax on the growth of bovine tubercle bacilli proved less than that of glycerin on the growth of human tubercle bacilli.—R. O. MUIR.

BOQUET, A. (1939). Le problème de la virulence du bacille de Koch. [**The Problem of Virulence of** *Mycobact. tuberculosis*].—*Ann. Inst. Pasteur.* **63.** 531–553.

In a comparison of the methods of diagnosis of type of tuberculous infection by determination of specific virulence, the reliability of subdural inoculation of the rabbit is stressed in the differentiation of even the most virulent human strain or of a relatively avirulent bovine strain. Subcutaneous injection of g. pigs with doses of 0·01–0·000000001 mg. of culture is regarded as the best method for actual titration of virulence, since intravenous injection of the rabbit may be complicated by toxic effect out of all proportion to virulence. Titration of the virulence of bacilli from skin tuberculosis may require completion by the injection of g. pigs with doses of 0·1–10 mg. A discussion of natural variation of virulence includes references to the isolation of attenuated bovine bacilli from early lesions of skin tuberculosis and of fully virulent human type bacilli from long-standing cases of lupus in man. Consideration of the stability of naturally or artificially attenuated strains and of characters of the various types of bacillus is followed by a lengthy review of the correlation of virulence with biochemical structure, allergic reactions, clinical signs of infection and immunity.—R. O. MUIR.

WELLS, A. Q., & BROOKE, W. S. (1940). **The Effect of Vaccination of Guinea-Pigs with the Vole Acid-Fast Bacillus on Subsequent Tuberculous Infection.**—*Brit. J. exp. Path.* **21.** 104–110. 4 tables. [2 refs.]

The vole acid-fast bacillus [*V. B.* **9.** 520.] may produce a progressive

disease in g. pigs when injected in large doses (5 mg.), but with small amounts a local reaction followed by regression of the lesions is the rule.

In the experiments described a comparison was made between the degree of protection conferred by sub-lethal doses of the vole organism (up to 2 mg.) and by BCG (30 mg.) against subsequent infection with very small doses of virulent human or bovine bacilli. The majority of the animals were killed 11 weeks after the test dose. Most of the g. pigs receiving the vole strain exhibited no macroscopic lesions, or at most a small local abscess, but in a few there were very early signs of generalized TB. Those vaccinated with BCG, on the other hand, showed generalized TB., although the disease was less advanced than in the controls. There were differences between the control and vaccinated animals in the development of skin sensitivity to O.T. or to P.P.D.—R. E. Glover.

Mochida, I. (1939). **On the Variant Types of *Bacillus mallei*. II. Systematic Research on Variant Types. III. Virulence, Serological and Allergic Reactions of the Colony Types.**—*Jap. J. vet. Sci.* **1.** 47–74 and 157–183. 15 figs. on 4 plates, 31 tables. [Numerous refs.] [In Japanese: abst. from English summaries]. [For Part I, see *V. B.* **3.** 671].

I. All of 144 strains of the glanders bacillus of the S type, on isolation from 99 infected horses, became readily transformed to the R type by sub-cultivation, especially in broth, and rarely reverted to the S type. From these results, it is inferred that the S type may be regarded as the original form of *Pfeifferella mallei*. S and R types could generate four variants, P, C^1, C and M types. These retained to a certain degree the characters of the parent type in colony form, bacterial body, and virulence. Both S and R colonies produced a marginal outgrowth of thin, transparent and corona-like film, the pseudo-marginal (P) type. This was considered an intermediate form between S and R and also a reversion from R to S. S or R types varied to C through C^1 which had an incompletely corrugated appearance, and M type, as a variant of C type, seemed to be an intermediate form in reversion from C to its parent colony.

Two kinds of colony were dissociated, the normal size and the dwarf variant (D). D type was only isolated from one natural case of glanders, but was obtained from agar culture covered with liquid paraffin, and was also easily isolated by cultivation on dye media.

II. The R variant was far less virulent than the S type and, especially in its filamentous form, was even non-pathogenic. The virulence of C and M types depended on whether they originated from S or R types. In the S type the virulence of each variant became higher with increase in the size of the colony, and in the R type the virulence seemed to decrease as the length of the variant bacteria increased, the filamentous form thus being almost non-pathogenic. The types could not be differentiated by agglutination, absorption or complement-fixation tests. Mallein prepared from S and R types was equally potent.—S. J. G.

Olson, C., & Goetchius, G. R. (1937). **The Reaction of Chickens to Certain Members of the Colon-Paratyphoid Group of Bacteria.**—*Cornell Vet.* **27.** 354–366. 3 tables. [13 refs.]

Four groups, each of five fowls, were given ten daily intravenous injections respectively with (a) "*Salmonella anatum* var. *aertrycke*," (b) and (c) two strains of bacteria from the colon-paratyphoid group which had been isolated from the alimentary tract of birds with fowl paralysis, and (d) sterile saline. A separate fifth group of ten chickens was fed daily for 15 days a culture of one of the strains used in (b) and (c). Observations on symptoms, cellular changes in peripheral

blood, pathology and bacteriology of lesions, etc., are presented in detail. A marked heterophilic granulocytosis occurred in chickens receiving bacteria intravenously. Those inoculated with " *S.a.* var. *aertrycke* " showed the highest counts and all died. Most chickens inoculated with strains (b) and (c) survived and blood counts returned to normal. Arthritis occurred in some cases in group (a). No specific pathological changes followed the feeding experiment. No cases of transmissible fowl leucosis or fowl paralysis were observed, and the authors were unable to substantiate the claim of EMMEL [*V. B.* **8.** 793.] that these diseases may be produced with such bacteria.—H. E. HARBOUR.

ROBERTS, E., SEVERENS, J. M., & CARD, L. E. (1939). **Nature of the Hereditary Factors for Resistance and Susceptibility to Pullorum Disease in the Domestic Fowl.**—*Proc. 7th World's Poult. Congr., 1939.* pp. 52–54. 2 figs., 4 tables. [7 refs.] Washington, D.C.: U.S. Dep. Agric. [In English]. [Authors' summary copied *verbatim*].

Evidence that resistance and susceptibility of the domestic fowl to pullorum disease are related to the number of lymphocytes was obtained from blood studies of resistant and susceptible chicks. This evidence consists of the following :

The number of lymphocytes is greater in resistant than in susceptible chicks.

Resistance in both resistant and susceptible chicks increases with age and the number of lymphocytes also increases.

When the number of lymphocytes in day-old chicks is reduced by X-rays, susceptibility is increased.

When 6-day-old chicks which have become resistant because of age are X-rayed, the number of lymphocytes is decreased and they become susceptible, as they were when younger.

From blood studies of chicks from the fifteenth day of incubation to the eighth day after hatching, it was found that the number of lymphocytes in the resistant chicks become greater than in the susceptible ones at about the eighteenth day of incubation.

These facts suggest that the difference between resistant and susceptible chickens is due to an inherited differential in the number of lymphocytes at the time of greatest susceptibility to pullorum disease, which is immediately after hatching.

I. —. (1937). **Report on Conference on Bang's Disease of the North Atlantic States, Springfield, Massachusetts, May 26, 27, 1937.** pp. 80. Springfield, Massachusetts. [8vo].

II. WIGHT, A. E. (1937). **Progress in Bang's Disease Control Program.**—*Rep. Conf. Bang's Dis. N. Atlantic States, 1937.* pp. 3–6. Springfield, Massachusetts.

III. GIVENS, H. C. (1937). **Bang's Disease Control under the Area Plan.**—*Ibid.* pp. 6–15.

IV. SMITH, R. W. (1937). **New Hampshire's Program of Bang's Disease Control.**—*Ibid.* pp. 15–20.

V. ANDERSON, G. W. (1937). **Undulant Fever in Man, and its Relation to Bang's Disease in Livestock.**—*Ibid.* pp. 20–24.

VI. COTTON, W. E. (1937). **Vaccination against Bang's Disease.**—*Ibid.* pp. 24–30. [18 refs.]

VII. DEUBLER, E. C. (1937). **Some Pitfalls in Maintaining a Disease Free Herd, from a Breeder's Viewpoint.**—*Ibid.* pp. 30–35.

VIII. BARNES, M. F. (1937). **Progress in Bang's Disease Control in Pennsylvania.**—*Ibid.* pp. 36–40.

IX. WISNICKY, W. (1937). **Progress in Bang's Disease Control in Wisconsin.** —*Ibid.* pp. 51–58.

X. HARDENBERGH, J. G. (1937). **The Problem of Controlling Bang's Disease in Large Dairy Herds.**—*Ibid.* pp. 59–62. [1 ref.]

XI. CORWIN, G. E. (1937). **Bang's Disease Control in Connecticut.**—*Ibid.* pp. 62–66.

XII. BIRCH, R. R. (1937). **Reinfection of Herds.**—*Ibid.* pp. 69–71.

XIII. RETTGER, L. F. (1937). **The Suspect—how should it be handled?**—*Ibid.* pp. 71–80.

I. This conference resulted from a previous meeting held by the cattle breeders of the New England states, at which it was urged that state regulatory officials should confer in an attempt to bring about more uniform regulations, and that these officials and laboratory workers should confer to bring about standardization of abortion testing methods.

II. This paper has been published elsewhere [see *V. B.* **7.** 459].

III. Testing requirements for brucella infection adopted by other states made a programme of eradication necessary in Virginia, as on account of these requirements the animals taken out of the state were those which were apparently free from the disease, and those which were infected were left behind. For approximately one year from the inauguration of the state-wide programme to eradicate brucellosis, started in July 1934, the testing and eradication were carried out on a voluntary basis, but the system was found to be unsatisfactory and eradication on an area- or county-wide basis was undertaken in June 1935. This method has proved effective and satisfactory.

Brucellosis eradication under the area plan and according to the area regulations adopted by the U.S. Live Stock Sanitary Association at Chicago in December 1936, provides for :– (1) the reduction of brucella infection in areas to 1 % or less ; (2) accreditation for a period of one year, and the necessary retesting to reduce the percentage of infection to 0·5 % or less in the area, and (3) accreditation for a three-year period with the proper retesting and re-accreditation. These measures will maintain an area free from brucellosis. Replacement cattle for an area must come from herds in which the entire herd is negative. Cattle, from untested areas, tested for interstate shipment and for replacement purposes on a single test, are unsatisfactory for the recruitment of clean herds. In no case has brucella infection in other animals interfered with the eradication plan in Virginia. In the area method of eradication the isolation of infected animals on the farm is entirely unsatisfactory. The programme has been extended to include 72 of the 100 Virginia counties. In 53 of these counties, which include 246,893 animals, the incidence of infection has been reduced to 1 % or less. The spread of brucellosis has been completely stopped in 53 counties in Virginia, and in these counties cattle may be mingled, without risk of spread of disease.

IV. In 1935, the Legislature amended the Animal Industry Law to make it possible for an owner to apply for a brucellosis test and provided for the payment of indemnity on animals condemned on account of the disease. New legislation was to provide that when 60 % of a town or county has been placed under supervision, or the owners of herds have applied for a test, the Commissioner may declare the town or county a quarantined area and proceed to test all animals in the area.

On April 1st, 1937 there were 1,170 herds comprising 19,119 animals under supervision and 153 accredited herd certificates had been issued. The main problem of the eradication of brucellosis in New Hampshire is that of finding funds for payment of indemnities. If the necessary funds are forthcoming it is considered that the disease can be eradicated within a five-year period.

V. A. discusses the sources of human infection with *Br. abortus*. He deals with the potential danger to human beings of the use of the various types of live vaccine on cattle.

VI. C. considers that the vaccination experiments conducted by the Bureau of Animal Industry (B.A.I.) and by HART and TRAUM have indicated that, for unbred heifers, vaccination is both effective and free from serious objectionable features.

In an attempt to immunize cattle with the porcine strain it was found that, while resistance was increased somewhat when the vaccine was given during pregnancy, the udder of a considerable number of vaccinated animals became infected with the vaccinal organism.

Experiments carried out indicated that a vaccine prepared with a strain of *Br. abortus* avirulent for g. pigs may for a time be capable of inducing in cattle a measurable though not marked resistance to infection, but after too long a sojourn on artificial media the strain may lose this power. Vaccines made from strains of *Br. abortus* of low virulence as well as virulent ones greatly increase resistance of cattle to artificial exposure which may be so severe as to infect 85·2% of the controls and to cause 81·5% to abort or to give birth to premature calves.

The B.A.I. has given considerable attention to calfhood vaccination. In the last completed experiment, 10 pregnant heifers, vaccinated when calves, were given so severe an artificial exposure to *Br. abortus* as to cause all 10 of the similar unvaccinated controls to abort, whereas 8 of the 10 vaccinated animals gave birth to normal calves with no infection either in the milk or uterus. Two gave birth to calves which died, and infection was demonstrated in the dams. The combined results of four experiments were, that of 43 vaccinated calves, 93% later produced vigorous calves which survived, 80% resisted infection entirely and 7% aborted or gave birth to weak calves. Of 33 controls, 36·1% later produced vigorous calves which survived, 27·7% failed to become infected and 63·9% aborted or gave birth to weak premature calves.

VII. D. spoke both as a breeder of purebred livestock and as a veterinarian. He considers that one of the greatest pitfalls in maintaining a disease-free herd is the failure to develop the necessary confidence between the breeder and the veterinary surgeon, this being largely due to the difficulty of securing unconflicting evidence as to the best methods to adopt. Herd owners are also suspicious of the existence of some ulterior motive behind the state schemes, whereby they are led to bear losses for the good of the whole state.

D. considers that in clean herds, horses which are allowed to run with the cattle should be blood tested; pigs, sheep and goats on the premises should also be blood tested. Fodder, manure, used bags, etc. should be purchased only from clean farms and entry of vehicles into clean premises should be restricted.

D. considers that there should be legislation to ensure that biological products are not contaminated with *Br. abortus*. The case is cited in which a "clean" animal was injected with brucella contained in haemorrhagic septicaemia serum.

VIII. In 1926 bovine brucella infection was proclaimed by the Pennsylvania B.A.I. as a notifiable disease, and from February 1927, restrictions were placed on reacting animals. Herd owners in Jefferson county took a leading part in freeing their cattle from infection and keeping them clean. In the last report, out of 14,800 cattle in the county only 34 reactors were disclosed and of these 29 had been brought into the county by a dealer.

Up to the time of the beginning of the Federal-State Co-operative Plan in 1934, testing in over 7,000 herds had been done in Pennsylvania and more than 1,000 Bang's disease free herd certificates had been issued. In 1935, after the Federal-State Co-operative Plan came into operation, 220,000 blood samples were tested

at the Pennsylvania B.A.I. laboratory, an increase of 100% over the previous year. During 1936, the number of blood samples examined was 314,000.

There are 183,742 herds in Pennsylvania comprising approximately 1,500,000 cattle of which 20,893 herds of 262,837 cattle were tested under the Federal-State Co-operative Plan up to May 1937. In June 1937 there were 4,000 certified herds in the state.

Approximately $800,000 was to be available during the next two years for payment of indemnity.

Vaccines for brucellosis in cattle may be used only by permit issued by the B.A.I.

The sale of raw milk in Pennsylvania is regulated by a ruling of the Bureau of Milk Sanitation, requiring that herds which produce milk for sale shall be tested for brucellosis in accordance with the rules and regulations of the Pennsylvania B.A.I.

IX. The first organized programme for the control of bovine brucella infection in Wisconsin was formulated in 1927. Under that plan, which was in operation for some seven years, 3,000 herds were enrolled up to 1934 with 600 herds certified as free from infection.

The plate method of testing is primarily used and there were, in 1937, 335 veterinary surgeons qualified, after receiving special training, to carry out the test. All antigen supplied to veterinary surgeons for blood testing had been standardized at the Central Laboratory and there was complete control over all antigen used in the state.

There was in 1937 a Bang's area-test bill before the legislature. This bill makes it possible for a county to enrol under the area plan provided that 60% or more herd owners petition to have the Bang's disease area test applied.

In the course of the last three years 47,000 herds had been tested, involving 850,000 cattle and 2 million tests.

It was estimated that on July 1st 1934, 45·9% of herds were infected with brucellosis. On November 1st 1936, 38·2% of herds were estimated as infected.

X. A discussion of the hygienic principles on which successful control must be based.

XI. The estimated amount of infection in Connecticut dairy herds has for a number of years been 20% of the cattle, contained in 75% of the herds. The incidence of undulant fever in Connecticut is on the increase.

The method of blood testing adopted is the tube agglutination method only and all official tests are made in the Connecticut State College.

A large number of commercial dairymen have resorted to vaccination in lieu of eradication and the number of commercial dairy herds being vaccinated against abortion is steadily increasing.

In the state control scheme the definition of a Bang's disease free, accredited herd is one which has passed three approved consecutive blood tests, the tests being made with an interval of at least one year and not more than two years between the first and last tests. State laws prohibit the importation of infected or untested cattle.

In connexion with the work carried on under the Federal Plan, there were 206 herds under supervision up to May, 1937.

Up to date no appropriations had been available for the payment of indemnity on blood-reacting cattle and no funds had been allocated for giving free service to the herd owner. Two bills had been presented to the present legislature: one provides for the payment of indemnity for cattle positive on blood test, whilst the second, in the event of the first bill's being unfavourably received, provides for free veterinary and laboratory service and would carry an appropriation of $30,000.

XII. It may reasonably be assumed that a herd is free from infection when a period of ten months has elapsed during which there has been periodic testing and no new reactors have been found. True reinfection is usually brought into the herd by an animal, although there are many other ways in which infection may be carried. The recent reactor is highly dangerous. When the cow which formerly has been negative develops a reaction, it is highly probable that she will be a source of infection when she next calves, regardless of whether or not she aborts or carries the calf to full time.

In regard to replacements, the only safe plan is to purchase from herds which have had several consecutive negative tests, as the exposed animal which does not react is still a danger.

XIII. The suspect is an animal which reacts partially or incompletely to the agglutination test. On the strength of tests carried out for 4, 5, and 6 years on the same herds, and from other observations, R. considers that with very rare exceptions a confirmed reactor always remains a reactor. Newborn calves from positive dams are positive reactors, but in 3–7 months gradually throw off the infection and mature as non-reactors if not reinfected from without. Such calves which have not been reinfected may therefore be added to negative herds at maturity together with calves which have come from negative dams.

For many years the practice of testing blood samples by both the agglutination and the complement-fixation test has been followed at the Connecticut State Laboratory and remarkable agreement has been found between the two tests. The results of routine testing at the Storrs laboratory indicate that in herds where there is a rapid spread of infection, animals which give suspicious reactions should be regarded as being infected with *Br. abortus*. In herds which have previously had a clean record, and in which one or two doubtful reactions then occur, experience has shown that not more than 20% of such animals will develop into definitely positive reactors.

In 149 herds under observation, 64·5% required one or two tests to clean the herd. 22·7% required 3–4 tests and 12·8% of herds required more than four tests to become free of infection.—F. T. Boyle.

—. (1938). **Proceedings of the North Central States Bang's Disease Conference Held Under Auspices of the Minnesota Livestock Breeders' Association and the Wisconsin Livestock Breeders' Association at Saint Paul, Minnesota, March 28 and 29, 1938. [U.S.A.]** pp. 55. Saint Paul, Minnesota: The Farmer. [8vo] [$1.00].

The problem before the Conference was the efficient and adequate control of bovine brucellosis and Dr. A. E. Wight of the Bureau of Animal Industry outlined progress already made in control of the disease, with special reference to the co-operative Federal-State Bang's disease programme which began in July, 1934. The first tests of herds throughout the country indicated the extent of the disease to be approximately 10·5%. In connexion with work under the area plan, the system has been followed in 247 counties located in 22 states and in these counties initial agglutination blood tests were applied to approximately 1,750,000 cattle, disclosing an infection of 3·3%. A complete retest of all cattle in about 45 of the 247 counties indicated an infection rate of 0·5%. The records of the Bureau indicate that in three states more than 50% of the breeding cattle over six months of age are under supervision. In 11 states 25–50% of the cattle are under supervision, while in 16 states the figures vary from 10–25%. The average for the entire United States is 15·4%.

Reports were given on the work done in different states by Bureau of Animal Health inspectors.

The breeder's viewpoint concerning bovine brucellosis, and the agglutination test as a factor in control were discussed. With regard to the latter, the Conference considered that the following were highly desirable :– (1) the establishment of a central laboratory for production and testing of diagnostic agents ; (2) a working towards the objective of finally placing the responsibility for diagnosis in the hands of the field veterinarian, and (3) the carrying out of an educative campaign.

A summary is given of the results in 8,466 bovine and porcine specimens tested in parallel by rapid and tube agglutination.

The question of vaccination as a means of control was discussed. The results of calfhood vaccination with a culture of reduced virulence had not been sufficiently studied to determine the duration of a satisfactory level of immunity, and most of the experiments so far carried out had been accompanied by exposure to infection during the earlier pregnancies only.

The whole question of existing rules and regulations for the control of the disease was discussed and also the need for uniform regulations for the inter-state movement of cattle. The area test plan also came under discussion and the results are recorded of area tests in various counties.—F. T. Boyle.

I. Marcusson, E. (1939). Bekämpandet av smittsam kastning inom en större avelsbesättning. [**Control of Contagious Abortion in a Large Herd**].—*Svensk VetTidskr.* **44.** 144–155. 1 table. [1 ref.]

II. Marcusson, E. (1939). Agglutinationsförhållandena inom en kreatursbesättning med kronisk kastning (Brucella abortus Bang). [**Variations in Agglutinin Levels in a Herd with Chronic Brucellosis**].—*Ibid.* 237–240. 1 fig.

I. A description of the successful eradication of brucellosis from a herd of over 100 cattle between 1925 and 1938. There were facilities for keeping reactors and young stock away from the main herd. In the early years live vaccines were used freely, but they were subsequently abandoned and the segregation method described by van Oyen was used instead [*V. B.* **5.** 195]. The disease was eradicated in 1936 and the herd thereafter kept " clean ".

II. An account of the blood agglutination reactions extending over two years in 30 cattle, part of the herd referred to in I, which were segregated at a separate farm because they were reactors. During that period two animals continued to react at a titre of 1 : 100 or more, whilst the rest varied from negative to positive. Four of the cows aborted (three non-specific) and the remainder produced 59 normal calves and five premature calves.

The aggl. reaction blood titres are given of some of the cows before, at and after calving, and those of two cows with a peculiar reaction curve are illustrated graphically. Sixteen normal calvers gave a constantly positive reaction and the rest varied considerably, 14 becoming and remaining negative.

The agglutination test was carried out only at blood titres of 1 : 25, 1 : 50 and 1 : 100. M. concludes from his experience in I and II that a titre of 1 : 50 ought to be considered positive, and that animals reacting below this titre may usually be sent to clean herds without risk of infecting them.—J. E.

Edgington, B. H., & Donham, C. R. (1939). **Infection and Reinfection Experiments with Bang's Disease.**—*J. agric. Res.* **59.** 609–618. 6 tables.

Brucella abortus was introduced intravaginally into twelve heifers at periods ranging from 1½–5 months after conception. All except one developed relatively high agglutination titres within one month of the injection, and 11 aborted between the 5th and 8th month of gestation. Another four heifers were similarly treated

56–75 days prior to service. The resultant agglutination titres were not so high and did not persist over such a long period. All the heifers gave birth to live calves after normal periods of gestation. Two 14-month-old heifers were infected *via* the vagina and a third *via* the conjunctiva four, five and seven months respectively prior to service. After conception each received two additional exposures of *Br.a.*, two *via* the vagina and one *via* the conjunctiva. All three heifers developed relatively high agglutination titres within one month after exposure, the titres dropping sharply after a month. After reinfection the agglutination titres showed little variation and all three had normal gestation periods with living calves.

In four heifers vaginal inoculations were administered at periods ranging from 53–75 days prior to breeding. The animals were again bred 4–6 months after parturition and all conceived. During the sixth month of the second pregnancy three of the animals received *per os* a dose of *Br.a.* and the third received a similar dose during the fifth month of pregnancy. Two animals received additional exposures by vaginal inoculation four days later. During the second pregnancy the titres of the animals did not show alteration following the reinfection exposures ; three of the heifers had normal gestation periods and gave birth to healthy calves ; in the fourth animal the period was 252 days, and the calf was weak.

Four cows were exposed *via* the vagina and two others *via* the conjunctiva, and the animals were not bred until 4–7 months after exposure. Each received two reinfection exposures during the next pregnancy. Increase in agglutination titres was never as great as that following the first infection, and all the animals had normal gestation periods and gave birth to healthy calves.—F. T. Boyle.

Birch, R. R. (1939). **Accomplishments and Difficulties in Control of Bang's Disease.**—*Cornell Vet.* **29.** 173–181.

B. discusses the problem of controlling bovine tuberculosis and brucellosis. In controlling brucellosis replacements for clean herds should be obtained from approved herds, or advantage should be taken of the freedom from infection of young stock.

In many herds it is impossible to eliminate reactors in the early stages of eradication, because of economic considerations. Direct government support and indemnities must be provided as part of a brucellosis control scheme.

B. considers that the state should be responsible for the expenses of the testing of herds which are placed under the recorded and approved herd plans. Area herd testing is to be advocated.

The joining of the state and federal forces in the control of the disease has led in some states to confusion on the part of breeders as to who is really in charge, and regarding sources of authentic information. There is a lack of uniformity in the regulations of different states ; a state which is obliged to import large numbers of cattle must of necessity have more lenient regulations than one which is more nearly self-contained in this respect.

B. considers that the final and legitimate place of vaccination in the control of brucellosis has not as yet been established.—F. T. Boyle.

Zaharija, I. (1939). Prilog dijagnostici bruceloze. [**Diagnosis of Brucellosis**].—*Jugoslov. vet. Glasn.* **19.** 331–344. 1 fig., 5 tables, 2 diagrams. [Numerous refs.] [French summary].

An account of experimental and field trials with an " abortin " for ophthalmic or intradermal use. This substance was prepared from a thick suspension of heat-killed brucella in saline, to which a solution of chinosol had been added, and was compared with the agglutination and with Meinecke's clearing reactions

in preliminary tests on g. pigs, rabbits and sheep and later in field tests with cattle, horses and pigs. The abortin was useful by the intradermal method on all the above-named animals ; the ophthalmic method was, however, more convenient for sheep and equally convenient for large animals. The results of the field tests indicated that bovine brucellosis is wide-spread in Yugoslavia. The two abortin tests and the two serological agreed to the extent of 80%. It is concluded that the allergic test is promising and ought to be developed.

—B. Oswald (Novi, Yugoslavia).

van der Schaaf, A. (1938). De waarde van het serologisch onderzoek voor de diagnostiek der brucellosis bij het rundvee. [**Serological Brucellosis Tests on Cattle in Java**].—*Ned.-ind. Bl. Diergeneesk.* **50.** 283–295. 1 table. [18 refs.] [English summary].

The author compared the slow tube-agglutination test and the complement-fixation test in the diagnosis of *Brucella abortus* infection. Total or nearly total aggl. up to 1 : 75 was considered to be doubtful, total or nearly total aggl. up to 1 : 100 to be slightly positive ; and total or nearly total aggl. up to 1 : 150 or more, to be positive.

The table below shows the results obtained when the aggl. test results were checked by the c.-f. test.

Aggl. test results.		*Complement-Fixation Tests.*		
		+	±	—
798	++	657	54	87
182	+	62	27	93
511	±	57	32	422
9·754	—	28	27	9·699

—Jac Jansen (Utrecht).

Zarubkinskiĭ, V. S. (1938). Sravnitel'naya otsenka metodov diagnostiki brutselleza ovets. [**Methods for the Diagnosis of Brucellosis in Sheep**].—*Trud. Uzbek. nauchn.-issled. vet. Stan., Tashkent.* **9.** 19–21.

This is a study, based on known facts, of the comparative merits of agglutination and allergic tests in the diagnosis of brucellosis. No new information is given.

—E. Martin.

I. Miles, A. A., & Pirie, N. W. (1939). **The Properties of Antigenic Preparations from *Brucella melitensis*. IV. The Hydrolysis of the Formamino Linkage.**—*Biochem. J.* **33.** 1709–1715. 2 tables. [16 refs.] [For previous parts, see *V. B.* **10.** 15 and 356].

II. Miles, A. A., Pirie, N. W., & Philpot, J. St. L. (1939). **The Properties of Antigenic Preparations from *Brucella melitensis*. V. Hydrolysis and Acetylation of the Amino-Polyhydroxy Compound Derived from the Antigen.** —*Ibid.* 1716–1726. 2 tables. [Numerous refs.]

I. Formic acid was identified by various methods as a product of the hydrolysis of the fully antigenic formamino compound (AP), which remains after the removal of the phospholipids and the protein-like substance from the complex

native antigen of smooth *Br. melitensis* strains. Quantitative estimation is described of the volatile acid liberated during hydrolysis of AP with *p*- toluenesulphonic acid, and the amount corresponded to 9·5–11·0% of formyl groups. Determination of the mode of linkage of the formic acid by a method based on extraction with methyl ethyl ketone showed that formic acid and amino groups were liberated at similar rates during hydrolysis of AP, indicating that the starting material was an N-formyl derivative. Solutions of AP, after the removal of phospholipids, phosphate and the formyl group, reacted with nitrous acid under the same conditions as α-amino acids and glucosamine. Although solutions of the amine and its formyl derivatives were not precipitated by homologous brucella antisera, the various fractions of the hydrolysates of AP were serologically comparable by measuring their capacity to inhibit agglutination of *Br. melitensis* by a monospecific serum. Inhibiting power was progressively reduced with loss of phospholipid or formyl groups and with the destruction of the amine.

II. Estimations of total sugar by heating with orcin and sulphuric acid showed that the complex amine (AP), obtained as a final product of the hydrolysis of *Br. melitensis* antigen, contained 14% carbohydrate estimated as glucose. Reducing sugar and amino sugar estimations of hydrolysates indicated that one product of the hydrolysis of the amine was an amino sugar in some ways analogous to glucosamine and with the amino group in a position other than 2 in the diagram of the molecular structure. The properties of the product of deamination of the amine by nitrous acid were compared with those of deaminated glucosamine. The properties and interrelationships of the substances resulting from O- acetylation of AP, formylated amine, amine and hydrolysed amine are discussed and the products of acetolysis of N- and O- acetylated amine are described. Examination of 0·5–0·95% solutions in 0·2 *M* NaCl plus 0·01 *M* phosphate of pH 7·0 in a Svedberg oil-turbine ultracentrifuge, by the " diagonal schlieren " method showed that original and reaggregated AP were poorly homogeneous, free amine was slightly homogeneous, while disaggregated AP and the formyl derivative of the amine were very homogeneous.—R. O. Muir.

Adey, C. W., & Kennedy, May. (1939). **The Efficacy of Sero-Vaccination of Lambs against Tetanus.**—*Aust. vet. J.* **15.** 205–209. 2 tables, 1 graph. [6 refs.]

Three groups, each of six lambs, were inoculated as follows :– group A, tetanus antitoxin, group B, tetanus toxoid (alum precipitated), group C, tetanus antitoxin in one thigh, tetanus toxoid in the other. Periodic determinations of antitoxic content of the sera showed that in group A there appeared immediately appreciable amounts which gradually decreased and disappeared in three weeks ; in group B antitoxin appeared about eight days after injection and attained a high level which was maintained for at least 60 days ; in group C there was an immediate rise followed by a slight fall to a level about half that of group B which was maintained for at least 60 days. Inoculation of activated spores between the 99th and 135th days after vaccination was survived by all animals in groups B and C, whereas all those in group A died.

The immediate response to injection of antiserum, as measured by the level of antiserum in the circulation, was not affected by the simultaneous inoculation of toxoid, but, on the other hand, the response to the toxoid was somewhat lessened by the simultaneous inoculation of antiserum.

It is concluded that where an immediate and an enduring immunity to tetanus is desired this may be accomplished by simultaneous inoculation of serum and vaccine.—W. I. B. Beveridge.

DE MOULIN, F. W. K. (1939). Onderzoek naar den aard der immuniteit tegen boutvuur. [**The Nature of Immunity against Blackleg**].—*Ned.-ind. Bl. Diergeneesk.* **51.** 35–61. 4 tables. [English summary].

Groups of normal rabbits were inoculated as follows :– (1) with live, virulent *Clostridium chauvoei*; (2) with heat-killed bacilli; (3) with formol vaccine and later with live culture; (4) with culture filtrate and later with live culture, and (5) with filtrate and later with dead culture. In all cases the test inoculation was given into the edge of an ear, and the site of injection was extirpated after varying intervals and examined microscopically.

In the first group there was an intense hyperaemia with phagocytosis of the organisms which was not complete in 24 hours. In the second group there was little or no hyperaemia, but intense phagocytosis of the organisms was observed which was complete in about eight hours. In the third group there was moderate hyperaemia and very intense phagocytosis which was complete in eight hours. In the fourth group there was some hyperaemia and some phagocytosis, less intense than in the third group, but there was no multiplication of the organisms such as had occurred in groups one and three. In the fifth group the bacteria inoculated (dead) were slowly overcome without great tissue reaction.

In these experiments a formol vaccine was found very effective in conferring immunity, whilst the culture filtrate was useful on account of its action in inhibiting bacterial multiplication at the site of injection.

The properties of culture filtrate were studied and it was found that some of the strains of organism used produced a haemolysin, and further, that the red blood cells of animals immune to *Clostridium septique* were resistant to the action of the haemolysin.

The aggressin property of the culture filtrate was tested on numerous rabbits and g. pigs by injecting them with a mixture of virulent muscle powder and filtrate. It was found that the filtrate was capable of preventing death in animals inoculated with the mixture in certain proportions.

Observations were made on the blood picture of cattle and rabbits vaccinated with formol vaccine, culture filtrate or with live organisms. In all cases there was an intense leucocytosis and less regularly a lymphocytosis.

Work was carried out on the presence of a toxin or toxins in *Cl. chauvoei*. The following fractions were differentiated :– a thermolabile fraction which is present in liver broth cultures; a thermolabile fraction which is active against endothelium and gives rise to hyperaemia, oedema, and diapedesis, and a thermolabile haemolytic substance—aggressin—which has an inhibitory action on phagocytosis and also on multiplication of organisms in the body.

It was concluded from this work that formolized whole culture confers a more satisfactory immunity than culture filtrate.—JAC JANSEN (UTRECHT).

LEVENSON, S., & GRABAR, P. (1939). Ultrafiltration de la toxine du *Bacillus perfringens*, type C. [**Ultrafiltration of the Toxin of** *Clostridium welchii*, **Type C**].—*C. R. Soc. Biol. Paris.* **132.** 210–213. 1 table. [4 refs.]

Liquid cultures of *Cl. welchii*, Type C (*Cl. paludis*) were centrifuged after 23 hours' incubation at 37°C. As adsorption of haemolysin on to ultrafilters occurs if the toxin is in weak concentration, 800 c.c. of the toxic culture was precipitated by ammonium sulphate and the toxin redissolved in 90 c.c. of normal saline. All batches of this concentrated toxin were passed through membranes of 1,760 mμ a.p.d. (average pore diameter) and then through membranes of 460 mμ a.p.d. The resulting filtrate was then passed through various membranes in 5 c.c. amounts and the residue was resuspended in 5 c.c. of saline. Haemolytic and toxic titres of each filtrate were determined.

Membranes of 51 mμ a.p.d. allowed passage of almost all haemolysin ; those of 29·1 mμ a.p.d. retained some haemolysin, and those below 23·5 mμ a.p.d. retained all haemolysin. Membranes of 5·9 mμ a.p.d. failed to retain all toxin, showing that the toxin molecules are much smaller than those of the haemolysin fraction and smaller than those of egg albumen.—C. V. Watkins.

DISEASES CAUSED BY PROTOZOAN PARASITES

Halberstaedter, L. (1938). **The Effect of X-Rays on Trypanosomes.**—*Brit. J. Radiol.* **11.** 267–270.

It has been found that X-rays may destroy the infectivity of trypanosomes without destroying their motility, and experiments are now described to ascertain the doses of X-rays required to kill trypanosomes and the dose required to suppress normal division and, therefore, infectivity. It was found that the dose required to kill might be as high as 600,000 r. though some organisms were killed by a dose of 100,000 r. Approximately 0·02 of the lethal dose is required to suppress infectivity.—U. F. Richardson.

Bessemans, A., Janssens, P., & van Meirhaeghe, A. (1937). Diathermie " in vitro " par ondes courtes et ultracourtes, d'une souche arsénorésistante de " Trypanosoma gambiense ". [*In vitro* **Diathermy, by Short and Ultra-short Waves, of an Arsenic-Fast Strain of** *Trypanosoma gambiense*].—*Rev. Belge. Sci. méd.* **9.** 168–178. 7 tables. [5 refs.]

The authors, having previously reported [*V. B.* **9.** 530.] the lethal effects of exposing trypanosomes heated in a water bath to short wave or ultra-short wave irradiation, now record that when steps are taken to cool the test sample of blood the irradiation alone does not appear to damage the trypanosomes. In these experiments it was noticed that trypanosomes might retain their infectivity for half-an-hour after motility had ceased.—U. F. Richardson.

Hawking, F. (1940). **Culture of** *Trypanosoma gambiense* **in Blood from Normal and Infected Persons.**—*Ann. trop. Med. Parasit.* **34.** 31–34. 1 table. [3 refs.] [Author's summary copied *verbatim*].

Cultures of five strains of *T. gambiense* were obtained by the technique of Brutsaert and Henrard, using a mixture of human blood and Ringer's solution at room-temperature. Trypanosomes grew as readily in blood from cases of sleeping sickness as they did in that from normal controls ; hence there was no evidence by this technique of immunity against a second infection. In one case trypanosomes grew readily in blood containing appreciable quantities of antrypol (Bayer 205), and in another case a culture was obtained from a patient whose blood showed no trypanosomes during examination of stained thick films.

Richet, C., & Antoine, C. (1939). Immunisation chimiobiologique des rats blancs contre le " Trypanosoma equiperdum." [**Chemico-Biological Immunization of White Rats against** *Tryp. equiperdum*].—*Bull. Acad. Méd. Paris.* **122.** 471–477. 4 tables. [2 refs.]

Immunization of rats against *Tryp. equiperdum* was attempted by inoculating them subcutaneously with infected blood, and four days later, when trypanosomes appeared in the blood, treating them with 0·03 g. of sulfarsenol. The immunity was tested 36 days or more later by the inoculation of 10,000 trypanosomes. Of animals tested between the 36th and 60th days, 17 proved immune, 12 partially

immune, and 1 susceptible. Of 22 animals tested between the 61st and 100th day, 21 proved immune and 1 partially immune. After the 100th day, the immunity was unsatisfactory. The immunity could not be relied on to resist a test dose of over 10,000 trypanosomes. No agglutinins could be demonstrated in the blood of immune animals, and in only one case was such serum trypanolytic. A small number of experiments in which large numbers of trypanosomes were inoculated intravenously, followed two hours later by sulfarsenol treatment, also gave promising results.—U. F. RICHARDSON.

HOARE, C. A. (1940). **Studies on the Behaviour of *Trypanosoma evansi* in Tsetse-Flies with Special Reference to its Phylogeny.**—*Parasitology*. **32.** 105–121. 1 table, 1 map. [Numerous refs.]

Attention is drawn to the occurrence of short, stumpy forms in *Tryp. evansi* infections, and in two out of three strains of this trypanosome it was found that such forms appeared at irregular intervals in fairly large numbers. The relationship between *T.e.* and *T. brucei* is discussed, and it is pointed out that the short forms of the latter species tend to disappear with mechanical transmission. An attempt was made to find out whether *T.e.* had any power of surviving in *Glossina morsitans*, and whether it would undergo any changes similar to those encountered in *T.b.* infections. Whilst preparations made from the gut of flies which had ingested *T.b.* showed a mixture of motionless forms and broader, shorter, motile forms, the latter increasing in number between the 24th and 48th hours, similar preparations made from flies which had ingested *T.e.* showed none of the broad, short forms, and though a few trypanosomes might retain their motility for 24 hours, after 48 hours all the organisms were motionless and degenerated. It is not considered that this failure of *T.e.* to survive in *G. morsitans* contra-indicates a relationship to *T.b.*, as strains of the latter which have not recently undergone cyclical transmission tend to lose their power of developing in tsetse-flies.—U. F. RICHARDSON.

JADIN, J. (1940). Étude d'une souche de Trypanosoma simiae suis. [**Study of a Strain of *Tryp. simiae suis***].—*Ann. Soc. belge Méd. trop.* **20.** 69–73. [9 refs.] [Dutch summary].

A strain of *Tryp. simiae* isolated from swine in the Belgian Congo proved inoculable to swine and rabbits, but not to mice, rats, g. pigs, cats, sheep, goats or monkeys. Infection in rabbits was mild, only scanty trypanosomes appearing in the blood. In swine the incubation period varied from 2–6 days. After a short incubation period some pigs lived for four days, but after the longer incubation period death usually occurred within a few hours of the appearance of trypanosomes. After death trypanosomes rapidly disappeared from the blood which sometimes remained infective for several hours.

Cultures of the trypanosomes were readily obtained by adding a few drops of blood to Brutsaert and Henrard's medium, or Ringer's solution and human blood, and incubating at 28°C.—U. F. RICHARDSON.

HERRICK, C. A. (1939). **Changes Occurring in Blood of Chickens During Cecal Coccidiosis.**—*J. Parasit.* **25.** Suppl. pp. 34–35. [Copied *verbatim*].

Changes in the blood picture were found to start on the fifth day of infection with the advent of hemorrhage. With the onset of hemorrhage there was a reduction of erythrocytes and hemoglobin, a decrease in total and non-protein-nitrogen, a depletion of liver and muscle glycogen, a loss in blood volume and a reduced metabolic rate. Concomitant with these changes there was an increase in the sugar and sodium chloride content of the blood which rose progressively from the

fifth through the seventh day of infection. During this period the osmotic pressure of the blood was found to remain relatively constant.

BOUGHTON, D. C. (1939). **Studies on the Control of Poultry Coccidiosis. 1. The Sporulation of Oocysts in Various Types of Litter.**—*Bull. Ga Univ.* **39.** No. 8. 9–14. 1 table.

This investigation was made to determine whether a deep litter in poultry houses was adverse to sporulation of oocysts. Infected samples from the alimentary tract were mixed and moulded into blocks, 10 × 10 × 5 mm., wrapped in two layers of cheese cloth and placed in paper bags in test litters composed of shavings, sawdust, faecal material, shavings with faeces or sawdust with faeces, either one or five inches below the surface. A number of sporulation tests were also made in fluid substrates containing 2% potassium bichromate solution.

Half of the experiments were made in the laboratory at room temperature, and half in an unheated outbuilding. After 3–6 days, the faeces samples were examined microscopically for 10 min. [The exact smear preparation technique is not stated. A time factor instead of a total count of an exact dilution of the faeces does not seem to be a good basis for comparative results. No check tests on the oocysts in faeces samples are mentioned.] Sporulated, unsporulated and degenerated oocysts were recorded.

B. concludes from his findings, which are tabulated, but appear to be very uneven, that a deep litter might reduce the number of infective oocysts while the birds are still young, through the effects of drying and dilution, but that it could not be relied on under all circumstances.

Conditions affecting survival of infective oocysts will form a further study.

—C. V. WATKINS.

LEGG, J. (1939). **Recent Observations on the Premunization of Cattle against Tick-Fevers in Queensland.**—*Aust. vet. J.* **15.** 46–53. [1 ref.]

L. briefly describes the events which led to the use of the methods at present employed for the treatment of tick fever of cattle in Queensland. Prior to 1932, it was considered that *Babesia bigemina* was the only pathogenic protozoon concerned, but in that year L. found that *Anaplasma marginale* occurred in north Queensland and, later, that it was widely distributed throughout the tick areas of the State. In 1935 another organism, *Babesiella argentina*, was discovered in north Queensland, and an investigation of a limited number of outbreaks of tick fever at that time indicated that this parasite was always present and was often unaccompanied by any other pathogenic protozoon.

Considerable experimental work showed that carriers of *B. bigemina* did not react severely to artificial inoculation with *Babesiella argentina*, whereas a severe reaction resulted when the inoculation was reversed. Later work, however, has shown that although carriers of *B. bigemina* appear to be highly resistant to artificial infection with *Babesiella argentina*, they often develop severe or fatal natural infection with the latter when exposed to tick infestation in the field. On the assumption that " clean " cattle sent to tick-infested areas might become infected with all three parasites, such animals were inoculated with *B. bigemina* and *A. centrale* before exposure. It was expected that the acquired resistance to the first would enable animals to withstand natural infection with both it and *Babesiella argentina*, while *A. centrale* inoculation would give protection against *A. marginale*.

L. also discusses the distribution of cattle over areas which are heavily and lightly infested with ticks and over those which are tick-free. He states that the following classes of animals require protective inoculation :– (a) store cattle from

areas lightly tick-infested, (b) animals from permanently clean areas and (c) stud stock from clean areas of Queensland or from the southern tick-free States destined for tick-infested properties.

In the last two years most of the outbreaks investigated have been proved to be due to *Babesiella argentina* infection. The two methods of immunization discussed are :– simultaneous inoculation with *B. bigemina* and *Babesiella argentina*, and separate inoculation with the first followed, soon after reaction, by the second. The latter should be adopted in the case of valuable stud stock. The simultaneous method proved a more dangerous procedure. At times heavy losses resulted from *Babesiella argentina* infection, and yet at others the loss did not exceed 2%.

L. mentions the use of acaprin for controlling severe reaction, but draws attention to practical difficulties. Where inoculated cattle graze on paddocks of thousands of acres, roping in the open would be necessary in order to apply drug therapy and he considers that the violence of this procedure might be sufficient to nullify the effect of the drug.—T. S. Gregory.

Buck, & Metzger. (1940). Note sur la babesiellose à *Babesiella berbera* chez des zébus, des métis-limousins et des limousins purs à Madagascar. [*Babesia berbera* **Infection in Zebus, Limousines and Zebu-Limousine Crosses in Madagascar**].—*Bull. Soc. Path. exot.* **33.** 89–93. [1 ref.]

Zebus are usually considered resistant to piroplasmosis, but improvement in animal husbandry may be followed by lowered resistance and fatal infection may occur. Five cases of *B. berbera* infection amongst 280 zebus are described ; three of these were fatal. In half-bred zebu crosses twenty-three cases out of 650 animals are described. The disease appears in cattle, 1–2½ years of age, rarely later, and is most prevalent during the hot season. The temperature rises to 42°C. The conjunctiva is injected and there may be petechiae, but there is no icterus. Haemoglobinuria is always slow in appearing and if the case is treated early it is not observed. In acute attacks death may occur in one or two days. Recovery in properly treated animals is rapid and loss of condition is rare. Gonacrine given intravenously is very effective for treatment and more rapid in action than an intramuscular dose of " zothélone."—S. J. Gilbert.

Buck, G. (1940). A propos des piroplasmoses des équidés a Madagascar. [**Equine Piroplasmosis in Madagascar**].—*Bull. Soc. Path. exot.* **33.** 86–89.

Piroplasmosis of the horse in Madagascar was first described by Thiroux in 1903 and was later known to be due to *Babesia caballi*. Since 1931, frequent examinations of the blood of horses and mules in the vicinity of Antananarivo have proved negative. Blood from mules imported from Algeria in 1938 was inoculated into two horses. The first animal succumbed to an attack of *B. caballi*, the symptoms of which commenced 19 days after inoculation. The second animal passed through a mild attack by *B. equi* which commenced 28 days after inoculation. Neither *Rhipicephalus evertsi* nor *R. bursa*, vectors of *B. equi*, are known to exist in Madagascar.—S. J. Gilbert.

Roets, G. C. S. (1938). **Coproporphyrin Excretion in East Coast Fever of Cattle.** —*Onderstepoort J. vet. Sci.* **11.** 385–388. 2 figs. [12 refs.]

Evidence is submitted of the excretion of porphyrins in a protozoal disease, East Coast fever. The series I and III porphyrins were found in cases of the disease in the urine and faeces. The ratio of series I to series III in one case was 1 : 1·15. In another case, only a trace of series I could be found. The series III porphyrins occur in a number of well-known pathological conditions.—E. M. R.

LAVRENT'EV, P. A. (1938). Opyt smeny pastbishch pri teĭlerioze krupnovo rogatovo skota v ravninnykh usloviyakh UzSSR. [**Experiments in Theileriasis Control by Pasture Rotation**].—*Trud. Uzbek. nauchn.-issled. vet. Stan., Tashkent.* **10.** 36–47. 1 table. [11 refs.] [English summary].

L. describes *Hyalomma detritum*, the main vector of theileriasis in the plains district of Uzbekistan, as a two-host tick which in its larval and nymphal stages spends the autumn, spring and winter on cattle hosts and reaches its adult stage in summer. Infection of the tick occurs during the larval and nymphal stages in autumn, and the virus is transmitted to susceptible hosts by adults in the following summer. The regular seasonal change from infected to infective stage determines the seasonal regularity of theileriasis outbreaks.

In accordance with these observations L. recommends in addition to regular anti-tick dipping, a simple division of the grazing area into two sections. There are two changes each year, one after the autumn-winter-spring period and the other after the summer, no area being grazed by cattle for a period estimated to be longer than that required by the ticks to reach the infective stage. Non-susceptible animals are grazed on the areas when they are not used for cattle.

—E. MARTIN.

COLES, J. D. W. A. (1939). **Aegyptianellosis of Poultry.**—*Proc. 7th World's Poult. Congr., 1939.* pp. 261–265. 5 figs. Washington, D.C.: U.S. Dep. Agric. [In English]. [Author's summary copied *verbatim*].

Aegyptianellosis, which seems to be confined to chickens, ducks, and geese, is caused by the hematozoon, *Aegyptianella pullorum*. It is transmitted by the tick, *Argas persicus*. An infected tick may remain a carrier at least 162 days. The incubation period after exposure to an infected tick is 12 to 15 days or more.

The most severe symptoms seen in South America were in chicks infected naturally during the first few days of life. They showed loss of appetite, dejection, a green diarrhea, and occasionally icterus, which could be noticed in the conjunctiva, the iris, and even in the ring around the eye. Death occurred in a day or two. Older fowls show the same symptoms but usually in a milder form, and there may be fever. The feces may be greenish yellow and very suggestive of fowl typhoid. Anemia and icterus may be noted. Jaundice is easily observed in the eye of the duck and gives the shank and foot a lemon-yellow color, if the skin is light.

In ducks and geese Aegyptianellosis is often associated with paralysis, especially of the legs. This paralysis, although apparently due to infestation with certain strains of *Argas*, may not be the result of *Aegyptianella pullorum*.

On post-mortem examination, a bird affected with Aegyptianellosis is found to have a swollen liver and spleen. In young chicks, these organs are yellowish or yellowish green. In adult birds, the spleen may be purple and the liver vivid green.

STRONG, R. P. (1940). **The Charles Franklin Craig Lecture for 1938. Progress in the Study of Infections due to Bartonella and Rickettsia, with Special Reference to the Work Performed at Harvard University.**—*Amer. J. trop. Med.* **20.** 13–46. [Numerous refs.]

S., discussing the nature of these organisms, points out that some workers think that they are closely related to the protozoa, and others have suggested that they form a missing link between the bacteria and viruses. It is generally agreed that bartonella are not filtrable, and until recently it was accepted that rickettsia did not pass through the finer porcelain filters. Though the psittacosis virus is

filtrable, many authorities consider that it is visible, and some have described a development cycle which would separate it from the ultra-microscopic viruses. It has also been accepted that the virus of climatic bubo is filtrable, but it has been shown that a rickettsia with a development cycle is responsible for the disease. Whilst the virus of trench fever is not filtrable as it occurs in the blood, yet several experiments have indicated that in a suitable medium, such as urine, it will pass coarse filters.

Both genera consist of pleomorphic organisms appearing as rounded forms about 0·3–1μ in diameter and rods measuring 1·5–2·5μ in length. They are gram negative and characteristically intracellular, but bartonella have a predilection for red blood corpuscles and produce anaemia, which rickettsia do not. Whilst it has been shown that the infective agent of rickettsial diseases is in the blood, it is not detectable microscopically. [This does not apply to the rickettsia of domestic animals occurring in monocytes.] Rickettsia are transmitted by lice, ticks and mites and fall into groups which correspond to the transmitting hosts. Bartonella are transmitted by *Phlebotomus*, lice and fleas. Bartonella are cultivable in cell-free media, but rickettsia are not, although they appear to occur extra-cellularly in invertebrates.

Protective inoculation against typhus is discussed, the following having been used as vaccines :– (1) defibrinated typhus blood heated to 60°C. for an hour ; (2) carbolized emulsion of the intestines of infected lice ; (3) formolized rickettsial bodies obtained by the peritoneal inoculation of g. pigs ; (4) carbolized emulsion of brain of infected g. pigs, and (5) rickettsia cultivated on embryonic chick tissue and killed with phenol. All these vaccines must still be considered as experimental.

Investigations into the relationship of verruga and Oroya fever are recorded, and brief mention is made of the bartonella and eperythrozoon infections of laboratory and domestic animals.—U. F. Richardson.

Schulz, K. (1939). **A Rickettsiosis New to South Africa.**—*J. S. Afr. vet. med. Ass.* **10.** 176–178. 1 fig. [1 ref.]

The presence is recorded of *Rickettsia ovina* in the monocytes, intima smears from the jugular vein, and lung smears of two sheep from South West Africa. In the flock from which the sheep came, severe losses had occurred. The disease was acute and recovery had not been recorded. At P.M. examination, changes reminiscent of heartwater were seen, but *R. ruminantum* could not be found in the hippocampus of either sheep. No heartwater ticks, *Amblyomma hebraeum*, had been noted in the area from which the sheep came. S. concludes that the heavy mortality in the sheep could not be attributed to a rickettsia infection alone, but that there were other contributing factors such as verminosis, nutritional disturbances and tick infestation.—E. M. Robinson.

Dubois, A. (1940). Inoculation du sodoku à la poule et à l'embryon de poule. **[Inoculation of *Spirillum minus* (Rat-Bite Fever) into Hens and into Chick Embryos].**—*C. R. Soc. Biol. Paris.* **133.** 100–102. [3 refs.]

Mouse blood infected with *S. minus*, the cause of rat-bite fever, was inoculated into fertile hens' eggs. Examination by dark-ground illumination 8–10 days later revealed two parasites in one egg only, but inoculation of susceptible mice with blood or emulsion from the embryos gave positive results in six out of eight tests. Attempts at serial egg inoculations of infected mouse blood were made ; positive results occurred in the first three passages, the fourth being negative. Three chicks rapidly succumbed a few days after hatching from inoculated eggs, and mouse inoculation showed that the parasites were in the chicks' tissues. No

parasites could be demonstrated in adult birds by microscopic examination or mouse inoculation 2–4 weeks after infection.—M. L. BINGHAM.

DISEASES CAUSED BY VIRUSES

—. (1939). **Virus Diseases [Discussion at the Meeting of the Australian and New Zealand Association for the Advancement of Science, Canberra, January 1939].** [Speakers: DICKSON, B. T., BALD, J. G., BURNET, F. M., GREGORY, T. S., BEST, R. J., LUSH, Dora, PRIESTLEY, H., YOUNG, W. J., MACKERRAS, I. M., RUBBO, & PRESCOTT, J. A.]—*Aust. J. Sci.* **1.** 145–148.

DICKSON opened the discussion with a brief, general review of virus research. Much of the subsequent discussion centred around the origin and nature of viruses, most speakers inclining to the view that viruses represent degenerate descendants of pathogenic organisms, and that whether or not they are to be regarded as living depends entirely on the criteria used to define " living ". MACKERRAS suggested that some blood-born viruses, *e.g.* those of yellow fever and ephemeral fever are descendants of protozoa such as anaplasms and piroplasms. LUSH suggested an explanation for the fact that a number of viruses which are non-infective for chickens grow on the chorio-allantoic membrane of the developing egg. Perhaps it is because metabolic activity is greatest in embryonic cells and the development of factors determining tissue specificity comes later, while the capacity to destroy or inhibit virus is developed still later.—W. I. B. BEVERIDGE.

ECCLES, A. (1939). Le rôle des oiseaux dans la propagation de la fièvre aphteuse. **[The Role of Birds in the Spread of Foot and Mouth Disease].**—*Bull. Off. internat. Epiz.* **18.** 118–148. 8 tables. [5 refs.] Discussion pp. 462–464.

This series of experiments was undertaken because epidemiological evidence suggested that migrating birds were capable of spreading F. & M. disease. A range of loose boxes was adapted so that birds could be confined to one or more boxes, and also moved from one to another.

During 1937–38, 359 dead and 54 live wild birds from infected farms or districts were examined for the presence of virus. Certain of the birds carried identification rings of German or Dutch origin. No suspicious lesions were observed. The feathers and all tissues of these birds were tested by g. pig inoculation for the presence of virus, with negative results. Each carcass was eviscerated and carcass and viscera were placed in contact with bovines. The 54 live birds were placed in contact with bovines. None of the cattle contracted F. & M. disease.

In a small number of experiments it was found that when starlings were artificially fed with virus they excreted it in the faeces for a short time. Virus sprayed on to the feathers persisted for at least 91 hours.

Starlings were placed in contact with infected bovines. When the infection had reached its height the birds were flown to boxes containing susceptible bovines. In one experiment the cattle became infected after contact with the birds, and in another experiment they did not.

Batches of 70 starlings were placed in contact with infected bovines. In one experiment the starlings were flown to an empty animal box where there was hay and bird food on the floor; after four hours they were flown to another box containing two susceptible cattle. Twenty-four hours after the birds had left the empty box, a bovine and three pigs were placed in it. In two other experiments, the birds were flown directly from the box containing the infected animals to a series of boxes each containing two bovines. They remained in one box for

14 days and in the others for a few hours. None of the contact animals in these three experiments became infected.

Approximately 40 pigeons were placed in contact with infected cattle. In one experiment the birds were flown direct to two boxes, one containing two bovines and the other two pigs. The cattle became infected but the pigs did not. In another experiment the pigeons remained in an empty box for five hours after leaving the infected cattle; they were then flown to a box containing two normal cattle which did not become infected. Three normal pigs were placed in the empty box as soon as the pigeons had left it, but they did not become infected although they ate the bird food which remained on the floor. In another experiment the pigeons were kept in flight for half an hour after leaving the infected cattle. They were then flown to a box containing two bovines where they remained for one hour, after which they were flown to a box containing two pigs where they were left for 14 days. Neither the pigs nor the cattle developed the disease.

It would appear from these experiments that birds play little part in the spread of F. & M. disease except, perhaps, over short distances. It is, however, suggested that some strains of virus may be more easily spread by birds than others. The insusceptibility of pigeons and starlings to natural infection appears to be established.

—John Francis.

Gerlach, F. (1938). Die mikroskopische Darstellung des Maul- und Klauenseuchevirus. [**Microscopic Demonstration of Foot and Mouth Disease**].—*Rep. 13th int. vet. Congr. 1938.* **1.** 243–244. [In German: Discussion p. 244 in German].

Material is obtained from cattle, swine or g. pigs, at the time when the vesicles show their greatest development, 2–3 days after infection. It is treated with alcoholic eosin for three-quarters to one hour and preparations are examined under the fluorescence microscope at a magnification of 1,000 ×. G. states that the identification of the virus bodies requires considerable practice. The spherical granule is the most common of the many forms found. Thread-like and ring forms with radiating filaments are also described. Marked phagocytosis of the granular forms by polymorphonuclear leucocytes is seen in sections of lesions.—J. B. B.

Sályi, G. (1939). Száj- és körömfájásos szívizomgyulladás fiatal báránykban. [**Myocarditis in Foot and Mouth Disease of Young Lambs**].—*Állatorv. Lapok.* **62.** 159–160.

A dead lamb and organs of two other lambs were received for diagnosis from a sheep farm where lamb mortality at the beginning of the lambing season was 70–80%. The lambs were lively and healthy at birth, but after a few days most of them sickened with gastro-enteritis and died. There had been single cases of F. & M. disease among the ewes but they were very mild and no connexion between these very few cases and the very high death-rate of the lambs was suspected.

There were no lesions of F. & M. disease in the mouth or on the feet of the lambs, in which S. found P.M.—in addition to the gastro-enteritis revealed by the clinical symptoms—parenchymatous and hyaline degeneration and myocarditis involving the whole heart. The cause of death was heart failure.

The heart lesion, which according to S. has been described by other authors in connexion with F. & M. disease in piglets but not in lambs, led him to suspect that the deaths might have been due to this disease. To test this possibility he inoculated material from the affected heart muscle on to the pads of three g. pigs by scarification. Two of the g. pigs developed typical vesicles of F. & M. disease and the infection was successfully transmitted to other laboratory animals.

S. believes that the absence of vesicles in the lambs was due to the rapid lethal course of the disease, the lambs having died before vesicles had time to develop.

MÖHLMANN, H. (1939). Ueber die Ausbrüche von Maul- und Klauenseuche in den ersten 14 Tagen nach der aktiven Immunisierung mit Vakzine nach Waldmann und Köbe. [**Outbreaks of Foot and Mouth Disease in the First Fortnight after Active Immunization with Waldmann-Köbe Vaccine**]. —*Berl. Münch. tierärztl. Wschr.* Sept. 8th. 565–570. 4 figs. [Num. refs.]

M. has extended the work described by STRODTHOFF [*V. B.* **9.** 83.] who considered that the occurrence of outbreaks of F. & M. disease in the first 14 days after vaccination was due to infection from outside sources and not to the presence of live virus in the vaccine.

In the summer, autumn and winter of 1938, nearly 550,000 animals in 36,832 herds were vaccinated in the control of an outbreak in East Prussia, by immunizing the herds surrounding each newly infected area. In 2% of the herds treated, cases of F. & M. disease occurred within 18 days of vaccination and M. is of the opinion that the infection came from outside and was not spread by the vaccine.

M. emphasizes that the vaccine is a safe and useful agent in the control of the disease in Germany.—J. B. BROOKSBY.

MAAS. (1940). Weitere Feststellungen über die Dauer der Immunität nach der aktiven Immunisierung mit Riemser MKS.-Vakzine nach Waldmann und Köbe. [**Duration of Immunity after Active Immunization against Foot and Mouth Disease by the Riems Vaccine**].—*Berl. Münch. tierärztl. Wschr.* Feb. 2nd. 49–52. 3 figs., 2 tables. [8 refs.]

In this supplementary report [see *V. B.* **9.** 767.], M. relates the results of vaccination up to 12–14 months after vaccination, during which period the disease was still present. 941 herds had been vaccinated with bovine virus vaccine and 2,401 with culture virus vaccine in the Soldin district. By the time that the disease had died out (in June, 1939), infection had occurred in nine of the former and in 24 of the latter herds (1% in each case) after intervals of 3–10 months after vaccination, but the percentage of vaccinated cattle which became affected in the herds concerned was very small (below 13% in all but two herds). The case histories of ten herds in which the disease appeared are given in detail. In nearly every case type A virus was the cause of the apparent breakdown of immunity [the type O virus was used in the vaccines].—J. E.

SINGH, B. (1937). **The Respective Merits of Virus Alone and Virus *cum* Serum Methods of Immunisation Against Rinderpest.**—*Proc. Anim. Husb. Res. Wkrs Conf. India, 1936.* pp. 36–39. Discussion pp. 39–41.

SINGH reviewed the position with regard to rinderpest in India since 1927, when goat virus was first employed alone. He stressed among its other advantages, its cheapness, safety, and prolonged effect. KERR stated that the efficacy and safety of goat tissue vaccine had been proved in Bengal. The danger of spreading the disease by use of a live [? goat] virus is negligible even among buffaloes. The serum-virus method is preferable for imported and Hill cattle, with precautions to avoid blocked-out reactions through the use of excessive doses of serum. SAUNDERS thought the serum-virus method unsafe for the highly susceptible buffaloes in Madras.

A concentrated desiccated goat spleen virus vaccine was referred to by PFAFF as having been used in Burma ; this in use on buffaloes caused a mortality of 10%, and it was considered that the dose used was too large. RILEY considered that

anti-rinderpest serum should be used with the goat tissue virus when immunizing buffaloes. OLVER in his summing up considered that the two methods of employing goat virus in India had equal merits, and that the serum-virus method was comparatively expensive as well as likely to be unreliable in results through the use of excessive doses of serum. He did not consider it feasible to inoculate all the cattle of a province by any method, and it would be necessary to carry on indefinitely immunizing each new crop of calves.—J. A. GRIFFITHS.

PFAFF, G. (1938). **Immunization against Rinderpest, with Special Reference to the Use of Dried Goat Spleen.**—*Onderstepoort J. vet. Sci.* **11.** 263–330. 9 figs., 17 tables. [Numerous refs.]

This article commences with brief descriptions of various methods which have been used for immunization against rinderpest. Of the older methods the serum-virus gives the most lasting immunity, but it has several drawbacks, the most important of which is that it may produce centres of infection. This disadvantage is eliminated by the use of tissue vaccines in which ground-up organs are treated with various disinfectants such as formalin.

Immunity from tissue vaccines, prepared from cattle infected with a bovine strain, only lasts a few months, but they do not create centres of infection. In recent years, a strain of rinderpest adapted to goats has been widely used for immunization of cattle. P. describes his method of preparation of the vaccine for use in Burma. Goats are killed on the fourth day after infection and the spleens are removed aseptically, ground up and dried *in vacuo* over calcium chloride. The dried spleen material is packed in thermos flasks containing ice. The ice is replenished every third day. For use, the vaccine is emulsified in normal saline. 1 g. will immunize 400 cattle or 2,400 buffaloes. A solid immunity results in 48 hours after inoculation. The duration of the immunity has not been determined accurately, but it is at least 755 days. P. expresses the opinion that unless vaccines contain living rinderpest virus they will not confer a lasting immunity.—E. M. R.

SCHOENING, H. W. (1939). **Equine Encephalomyelitis.**—*J. Amer. vet. med. Ass.* **95.** 268–272.

The Eastern type of virus has been found to be the cause in outbreaks in states along the Atlantic seaboard while in states west of the Appalachians only the Western type of virus has been recovered. Commercial chick-embryo vaccines were found to afford complete protection for g. pigs against the 15 strains. A few tests on horses showed that such vaccine can confer immunity against experimental infection for one year. After the field use of the vaccine on horses a few reports of severe local reaction with or without fever were received. An investigation proved that the vaccine was not responsible, unless the horses concerned were specially sensitive to chick protein in the vaccine, though a small experiment on this point gave negative results. Commercial chick-embryo vaccines are tested by the Bureau of Animal Industry before release for sale.

During 1938 the general incidence for the 39 states involved was 23·5 cases per 1,000 animals with a mortality of 21·4%. In the 11 eastern states there were 3·9 cases per 1,000 and mortality was 90·2%; in the other 28 states there were 24·8 cases per 1,000 and mortality was 19·8%.—J. A. GRIFFITHS.

SYVERTON, J. T., & BERRY, G. P. (1936). **Susceptibility of the "Gopher", *Citellus Richardsonii* (Sabine), to Equine Encephalomyelitis.**—*Proc. Soc. exp. Biol., N.Y.* **34.** 822–824. [9 refs.]

The authors present evidence of susceptibility to equine encephalomyelitis, Western type, of the Richardson ground squirrel. Twelve successive passages

through " gophers " were effected by intranasal instillation of brain-tissue suspension. After the 12th passage, the specificity of the virus was verified by its neutralization with rabbit anti-encephalomyelitis serum, Western type. It is suggested that the " gopher " and other wild rodents may possibly act as reservoirs for the virus in nature.

GWATKIN, R. (1939). **On the Susceptibility of Ground Squirrels to the Virus of Equine Encephalomyelitis and Ticks as Possible Vectors.**—*Canad. J. comp. Med.* **3**. 131–133. 2 tables.

It was proved that the grey gopher, *Citellus richardsoni*, is susceptible to the virus of equine encephalomyelitis, Western type, when inoculated intracerebrally. The course of the experimental disease in these rodents is shown to be shorter than in g. pigs when inoculated by the same route in comparable dosage.

It was shown that blood from engorged nymphs of the wood tick, *Dermacentor andersoni*, recovered from a gopher dead of experimental equine encephalomyelitis, contained the virus.

These results corroborate in part the findings of SYVERTON and BERRY [see previous abstract].—L. M. HEATH.

GONCHAROV, N. P. (1939). Khimicheskiĭ metod opredeleniya hemosiderina v pecheni pri infektsionnoĭ anemii loshadeĭ. [**A Chemical Test for Haemosiderin in the Liver and Spleen in Equine Infectious Anaemia**].—*Sovyet. Vet.* No. 8. pp. 31–32.

G. proposes that in the P.M. diagnosis of E.I.A., the presence of haemosiderin in the spleen and liver should be demonstrated by a chemical method instead of by the usual histological-pathological method.

Small samples of the spleen or liver are crushed and suspended in dilute hydrochloric acid, heated to boiling point, filtered, and added to a 10% watery solution of potassium ferrocyanide. The immediate appearance of a dark-blue colouring is considered as a positive result indicating the presence of haemosiderin. Absence of blue colouring or the appearance of light blue or greenish colouring is rated as negative. In 200 comparative tests with material from E.I.A. horses carried out by this method and by the histological-pathological method the results coincided.

It is claimed that the method permits tests to be made on the spot without laboratory facilities, thus eliminating the risk of the deterioration during transit of the materials to be examined.—E. MARTIN.

FOMINA, A. Y. (1939). Opyty kul'tivirovaniya virusa infektsionnoĭ anemii na krolikakh. [**Attempts to Infect Rabbits with the Virus of Equine Infectious Anaemia**].—*Sovyet. Vet.* No. 6. pp. 11–15.

After injection of washed red blood corpuscles of infected horses into rabbits, a condition similar to E.I.A. is said to have developed. Attempts to infect horses with material from these infected rabbits were unsuccessful.—E. MARTIN.

LE ROUX, G. (1938). La préparation du sérum contre la peste porcine à l'Institut Pasteur de Nhatrang. [**Preparation of Serum against Swine Fever at the Pasteur Institute of Nhatrang**].—*Arch. Inst. Pasteur Indo-Chine.* **7**. 297–318. 21 figs., 3 tables. [1 ref.]

Pigs of 60–90 kg. body weight are considered most suitable for the production of S.F. antiserum, both from the aspect of volume of blood obtained and ease of manipulation. Serum producers are either specially prepared pigs or healthy survivors from serum or vaccine tests. The first injection consists of 1·0 c.c. of

virulent defibrinated blood, diluted 1 : 100, simultaneously with 50–80 c.c. of S.F. antiserum according to body weight. An injection of 5·0 c.c. of undiluted, virulent defibrinated blood follows in three weeks. Temperature charts are given with examples of sero-infection, with and without thermal reaction. The virulence of the Algiers virus strain used for inoculation is maintained by passage through piglets of 18–25 kg. body weight, and the technique of obtaining virulent blood is described. Details of the technique of bleeding serum producers are given with useful illustrations of equipment, procedure, and frequency and yield of bleeding. After a review of difficulties met with in the course of bleeding, two methods of serum separation are described and compared. Yields of 30·33 % by coagulation and 48·68 % by centrifugation justified a preference for the latter method.—R. O. M.

ZELJKO, M. (1939). Prilog imunizaciji sisančadi imunih majka protiv svinjske kuge cepljenjem samim virusom. [**Immunization of Suckling Pigs from Immune Sows with Swine Fever Virus Only**].—*Jugoslov. vet. Glasn.* **19.** 300–304. [11 refs.] [German summary].

Z. inoculated virulent blood into 62 unweaned piglets, 1–54 days old, weighing from 1–20 kg., and the progeny of 13 immunized sows, in order to estimate the degree of their immunity against swine fever. Almost every one of them resisted the infection, and this immunity which was passive was proved to last for at least 26 days after birth, thereafter declining. Active immunity was produced in pigs protected with antiserum, by the injection of virus. In some cases 5 c.c. of virus conferred a strong immunity of at least 35 days' duration [later tests presumably not made.—Ed.]—B. OSWALD (NOVI, YUGOSLAVIA).

RAY, J. D., & WHIPPLE, G. E. (1939). **Effects of Heat on Phenolized Hog-Cholera Virus.**—*J. Amer. vet. med. Ass.* **95.** 278–282.

Experiments were carried out to determine the thermal point or points at which phenolized (0·5 %) swine fever virus is rendered avirulent or non-viable. The effects on the virulence of various temperatures, applied for varying lengths of time, are described. It was found that the application of heat of certain degrees and for certain periods " produced properties of a vaccine nature in the phenolized virus ". It was found that when the virus was heated to temperatures identical with those recorded in closed carrying compartments of motor cars (103°–136°F.), it was rendered avirulent. This temperature range was reached when the motor car was standing for some hours in sunshine, when the atmospheric temperature was 85–95°F.—J. R. LAWSON.

INDIA. (1939). **Report of the Haffkine Institute for the Year 1938.** [SOKHEY, S. S.] pp. iii + 90. Numerous tables, 13 appendixes. Bombay : Superintendent, Govt. Printing & Stat. [8vo] [Annas 3 or 4d.]

During the year, 167 brains were received for examination in the antirabies department of the institute. Negri bodies were present in 68·9 %. These positive brains were from 108 dogs, 3 buffaloes, 2 jackals, 1 horse and 1 donkey. The number of antirabies vaccine treatments issued for use by veterinary surgeons was 689 as compared with 315 during 1937.—J. A. GRIFFITHS.

VEERARAGHAVAN, N., & PHILIPSZ, G. L. C. (1938). **Cultivation of the Rabies Virus on the Chorio-Allantoic Membrane of the Developing Egg.**—*Indian J. med. Res.* **26.** 493–495. 1 fig. on 1 plate. [5 refs.] [Authors' summary copied *verbatim*].

Attempts to cultivate the rabies virus on the chorio-allantoic membrane of the developing egg were unsuccessful.

I. SHOPE, R. E. (1939). **Serological Studies of Swine Influenza Viruses.**—*J. exp. Med.* **69.** 847–856. 2 charts. [9 refs.]

II. SHOPE, R. E. (1939). **An Intermediate Host for the Swine Influenza Virus.**—*Science.* **89.** 441–442.

III. ROSENBUSCH, C. T., & SHOPE, R. E. (1939). **The Antibody Responses to Swine Influenza.**—*J. exp. Med.* **69.** 499–505. 7 figs. [8 refs.]

IV. DONATIEN, A., & LESTOQUARD, F. (1939). L'influenza du porc en Algérie. [**Swine Influenza in Algeria**].—*Bull. Acad. vét. Fr.* **12.** 169–174.

I. Three human and seven swine influenza strains were studied, all of which were well adapted to white mice. Immune sera were obtained from convalescent swine and also from rabbits which had been injected intraperitoneally with mouse lung suspensions. Neutralization tests were carried out with white mice and the same suspensions were used as in preparing the serum.

Using sera prepared in swine, S. found that all the swine influenza strains were immunologically identical, as were the three human strains. There was some relationship between the human and swine strains. With sera prepared in rabbits, two of the swine strains produced antibodies homologous to themselves, but not to the other swine strains. Two others produced sera which were effective against all seven swine strains, and the other three strains were of intermediate type. The rabbit antisera more effectively differentiated between the human and swine strains than did the swine antisera. It is considered that the swine influenza strains studied were of similar antigenic constitution, but that they varied among themselves in the arrangement of the antigenic components. As swine are susceptible animals, they probably respond to the whole antigen complex, whilst rabbits only respond to the surface antigen.

II. Experiments were undertaken to explain the persistence of swine influenza virus during the eight or nine months of the year when there are no cases of the disease. Lungworm larvae and adult lungworms from infected pigs were fed to earth-worms. After the lapse of one month the earth-worms were fed to pigs. The pigs remained healthy and developed no antibodies. When these pigs were given several intramuscular injections of *Haemophilus influenzae suis* they developed swine influenza which was typical both clinically and immunologically. Pigs not fed with infected earth-worms did not develop the disease when injected with *H.i.s.* It appeared that the action of *H.i.s.* was not specific, as an intrapleural injection of $CaCl_2$ also precipitated an attack of swine influenza. It is tentatively concluded that lungworm larvae from infected pigs harbour the virus throughout their development in the earth-worm, but that pigs which have ingested these larvae only develop the disease when some provocative stimulus is applied.

III. Five pigs were inoculated intramuscularly with a mixture of swine influenza virus and *H.i.s.*, and a sixth was given virus only. In the four animals which underwent typical attacks of swine influenza, antibodies developed within seven days of inoculation, and the maximum titre was reached in 14–20 days. Two animals developed filtrate disease only, and antibodies developed in them somewhat later than seven days, the maximum titre being reached by the 27th day. The titres did not appear to be related to the severity of the disease and varied from 1 : 60–1 : 160 as measured by neutralization tests in mice. In two animals which were kept under observation for 84 days, there was some decrease in titre from the highest level attained. It is pointed out that the appearance of neutralizing antibodies coincided with the cessation of symptoms.

IV. It is stated that in Algeria the disease differs in several respects from the swine influenza of America and the "Ferkelgrippe" of Germany. It is more prevalent during the cold months and, in the same way as swine influenza but in

contrast to " Ferkelgrippe ", it affects pigs of all ages and conditions. A short exposure to infection is sufficient to set up the disease, although many animals have only a subclinical infection, a clinical attack being precipitated by exposure to cold and fatigue or by swine fever inoculation. Symptoms commence suddenly with fever which is followed by cutaneous eruptions, respiratory, nervous and digestive disorders and anorexia. The pigs lie in groups under the straw and are indifferent to their surroundings, depression being a very marked symptom. The red-violet discoloration occurs in various parts of the body and consists of small plaques of varying colour; the nose is said to become red and the ears blue. A cough is nearly always absent, the only respiratory symptom being a double expiratory effort which occurs a few days before death. There may be profuse diarrhoea or severe constipation and paraplegia is common. The disease lasts several weeks in a herd and may cause considerable loss in condition and in some cases a mortality up to 60%, although this is rare.

The principal P.M. lesions are the petechiae which occur on all serous membranes and organs. There is a blood-stained exudate in the serous cavities. The lungs show areas of hepatization particularly in the apical lobes, the lymph nodes and spleen are enlarged and the former are haemorrhagic. There are areas of haemorrhagic necrosis with desquamation of the epithelium in the large intestine. The vessels of the pia mater are engorged and the volume of the cerebrospinal fluid is increased.

It is stated that the disease may be differentiated from swine fever by the prominent petechial haemorrhages all over the gastric mucosa, which vary from the size of a pin's head to that of a lentil; the petechiae in other parts of the body are also said to be characteristic. Influenza also only occurs in the winter, whilst swine fever occurs at all times of the year. The mortality in influenza is much less, the temperature curve irregular and it cannot be regularly transmitted by inoculation of blood from affected animals. It is stated that an intradermal test [*V. B.* **7.** 615.] may also be used to differentiate between this disease and swine fever. [There appear in many ways to be close resemblances between the disease described in IV, and swine fever.]—John Francis.

Schoch, A. (1939). **Sheep Pox Infection in Man.**—*Arch. Derm. Syph., N.Y.* **39.** 1040–1041. 2 figs. [2 refs.]

A case is reported of human infection with a virus presumed to be that of contagious pustular dermatitis. The patient, who had attended a flock of sheep, developed a pustular lesion on the wrist which lasted for three weeks. [Apparently no attempt was made to retransmit the condition to sheep. The disease is termed " sheep pox " but it is evident from the text that the author has failed to recognize the difference between sheep pox and contagious pustular dermatitis].—R. E. G.

Dobson, N. (1939). **Newcastle Disease.**—*Proc. 7th World's Poult. Congr., 1939.* pp. 250–253. 1 fig., 2 tables. [3 refs.] Washington, D.C.: U.S. Dep. Agric. [In English]. [Author's summary copied *verbatim*].

The largest known outbreak of Newcastle disease on a single farm in Great Britain is here recorded. The disease spread with great rapidity, and in a few days 5,000 birds were dead or affected and the carcasses incinerated.

Young fowls on range were particularly susceptible, and also chickens up to 6 weeks of age in battery brooders. Day-old chicks placed in dirty battery brooders 7 weeks after the removal of the infected chicks are stated to have become infected.

Two breeding pens of older birds, in an orchard adjoining the free range on

which were the affected birds, did not become affected, although before the diagnosis was made the attendant was walking among the affected birds on his way to the breeding pens. Similarly, in the early experimental passages of the virus, some old birds were found to be insusceptible. After several artificial passages of the virus, both old and young birds were readily infected. Twenty ducks on free range with the affected birds did not show symptoms of the disease and remained healthy. Experimentally, it proved impossible to infect ducks at the laboratory, either by inoculation or contact. Pigeons were successfully infected with the virus by inoculation and showed drooping of the wings, paralysis of the legs, breathing through the mouth, and partial or full closure of the eyelids.

The origin of the infection in this outbreak could not be discovered.

OLITSKY, P. K. (1939). **Experimental Studies on the Virus of Infectious Avian Encephalomyelitis.**—*J. exp. Med.* **70.** 565–582. 9 figs. on 3 plates, 4 tables. [11 refs.]

The object of this study was to determine the nature and physical properties of the virus of a disease described as " infectious avian encephalomyelitis ", as well as its relationship to the virus of equine encephalomyelitis.

There was practically no instance of successful transmission of the disease by contact infection. The method of dissemination in nature is still obscure. The disease could be readily reproduced by the intracerebral inoculation of infected brain emulsion. Pathogenicity by various other routes of inoculation was also determined. Mice, g. pigs, rabbits and monkeys were resistant under experimental conditions. Thus the virus differs from that of equine encephalomyelitis.

In chickens infected with avian encephalomyelitis, the syndrome was different from that in chickens similarly inoculated with the Eastern strain of equine encephalomyelitis. From a series of cross-immunity tests, using serum-virus mixtures, it was shown that the virus of avian encephalomyelitis and that of equine encephalomyelitis are independent. An attack of the experimental avian disease in birds confers protection against reinoculation, intracerebrally, with the same virus.

The virus is not easily sedimented by centrifugation ; it is resistant to the action of glycerol and to desiccation ; it readily passes Seitz and Berkefeld filters ; it passes through gradocol membranes of 73 mμ average pore diameter ; and it is active in dilutions up to 10^{-6}. The virus is seldom demonstrable in the blood of experimentally infected birds. [In this respect it somewhat resembles the virus of Newcastle disease of fowls.]

The main histopathological changes found in experimental avian encephalomyelitis are neuronal degeneration in the brain and spinal cord, marked perivascular infiltration with lymphoid elements in the central nervous system, hyperplasia of the normally present lymphoid islands, and the general absence of polymorphs and inclusion bodies in any of the pathological reactions.—S. G. IYER.

HUNGERFORD, T. G., & HART, L. (1939). **Preventive Vaccination Against Laryngo-Tracheitis.**—*Aust. vet. J.* **15.** 140–151. [12 refs.]

Infectious laryngotracheitis has been found to be widespread in New South Wales. The authors review the work done in the United States on vaccination against this disease and then describe in detail their own experiments. The vaccine was prepared by collecting tracheal exudate from birds killed in the peracute stage of the disease and grinding this with sand and 50 % glycerin. The exudate was used in a dilution of 1 : 20 in most experiments, but a 1 : 50 dilution also gave satisfactory results. The vaccine was used on the day on which it was prepared,

usually within a few hours. The method of inoculation was to insert a swab soaked with vaccine into the bursa of Fabricius and rub it vigorously on the mucous membrane. In adult birds in which this bursa had atrophied, the swab was rubbed on the mucous membrane of the cloaca. It was later found that when " steel wool " swabs were used, a higher percentage of " takes " resulted. Birds were vaccinated at from five weeks to three years of age, but a lower proportion of " takes " was observed in the adults. Where possible birds were examined on the fifth day after vaccination and those showing no reaction were re-vaccinated from the others. A reaction consisted of inflammation of the cloaca and commenced on the third or fourth day and passed off on the sixth or seventh day.

Vaccinations were carried out on approximately 10,000 birds on 13 premises with 26 separate vaccines. On one occasion the vaccinated birds contracted laryngotracheitis immediately after vaccination, apparently deriving the infection from the vaccine. Vaccinated birds were shown to be resistant to intratracheal inoculation and to natural contact infection.

It is suggested that each new season's stock should be vaccinated at 2–3 months of age unless it is possible to isolate it completely from survivors of previous outbreaks. It is desirable to use vaccine obtained from cases on the farm as this obviates the possibility of harm resulting from introducing laryngotracheitis into a flock affected with another disease mistaken for laryngotracheitis.—W. I. B. B.

PARASITES IN RELATION TO DISEASE [ARTHROPODS]

KNIPLING, E. F. (1939). **A Key for Blowfly Larvae concerned in Wound and Cutaneous Myiasis.**—*Ann. ent. Soc. Amer.* **32.** 376–383. 2 plates. [11 refs.] [Abst. in *Rev. appl. Ent.* **28.** 20, copied *verbatim*].

Keys are given to aid workers in identifying in the second and third instars larvae implicated in infestations in wounds and in cases of cutaneous myiasis in animals in the United States, together with one for determining to which instar a larva belongs. Second-instar larvae of *Lucilia* and second- and third-instar larvae of *Calliphora, Cynomyia* and *Sarcophaga* are not specifically identified in the keys.

JANJUA, N. A. (1939). **A Note on the Biology of *Lucilia sericata* Meigen (Calliphoridae, Diptera) in Baluchistan.**—*Curr. Sci.* **8.** 317–319. 4 figs. [8 refs.] [Abst. in *Rev. appl. Ent.* **28.** 20, copied *verbatim*].

In Baluchistan, where sheep farming is one of the principal occupations of the people, losses due to *Lucilia sericata*, Mg. are causing considerable concern, and investigations begun by the author in 1937 have shown that 20–25 per cent. of the sheep in three districts are attacked. The injury is described and notes are given on the morphology and bionomics of the different stages of the fly. The females are attracted to the sheep after showers of rain by the odour arising from the fleece, and deposit eggs in clusters of 15–27. One female may lay as many as 200 at one time and about 1,000 altogether. The egg stage lasted 10–40 hours, the larval stage 5–11 days, the prepupal stage 3–16 days in summer and 137–162 days in winter, and the pupal stage 15–21 days in summer and 28–33 days in spring. Adults lived for 25–55 days. The prepupae are usually found ¼ inch below the surface of the soil, but they hibernate at a depth of 6–12 inches and return to the surface during March before pupating. Pairing takes place 5–6 days after emergence. There are four generations a year.

DINULESCO, G. (1938). Recherches sur les gastrophiles en Roumanie. (Étude systématique et biologique). [**Research on** *Gasterophilus* **in Rumania**].—*Arch. roum. Path. exp. Microbiol.* **11.** 315–335. 11 figs. on 6 plates, 4 tables. [4 refs.]

D. records the presence of the following species of *Gasterophilus* in Rumania :– *G. intestinalis*, *G. haemorrhoidalis*, *G. pecorum*, *G. nasalis*, *G. inermis*, and *G. nasalis* var. *aureus* n. var. Morphological descriptions are given of these species which are all parasites of horses and mules ; the first three infest the stomach and the last three the intestine or rectum.

Observations were made on the activities of the adults and on the larvae found in dead horses and expelled from parasitized animals at various times of the year. The adults appear from July to October and live 1–3 days ; their habits as regards oviposition vary with the species. The larvae which appear first in summer complete stage 1 by August, stage 2 by October or November and stage 3 in May. When eggs are laid in the autumn, larval development begins later and may last from November to the following September. It is suggested that the best time to treat with larvicides is December and January.—R. P. HOBSON.

I. IONESCO-BRAILA, G., & DINULESCO, G. (1939). La mouche de goloubatz (*Simulium reptans* L) et son action pathogène. [**The Golubatz Midge** (*Danubosimulium columbaczense* **L.**) **and its Pathogenic Action**].—*Bull. Off. internat. Epiz.* **18.** 268–290. 6 figs., 2 tables, 2 graphs, 1 map. [11 refs.] Discussion pp. 475–476.

II. TOUPAÏTCH, M. (1939). La mouche de goloubatz et son rôle pathogène. [**The Golubatz Midge and its Pathogenic Role**].—*Ibid.* 291–310. 4 figs., 1 table, 1 map. [12 refs.] Discussion pp. 476–478.

III. BARANOV, N. (1939). La mouche de goloubatz. [**The Golubatz Midge**].—*Ibid.* 311–322. 1 fig., 1 map. [8 refs.] Discussion pp. 476–478.

I. A description is given of the plague of *Danubosimulium columbaczense* [referred to by the authors as *Simulium reptans*] which occurred in 1923. The question is considered from the viewpoint of the effects of temperature, atmospheric conditions, geographical features and rain. When a few insects attacked the animals once, their lives were not endangered, and animals attacked for several days during the invasion could be successfully treated if the bites were not numerous. When the animals were bitten by large numbers of insects some of them might die. Local symptoms included a button-like zone of inflammation round the bite, and often when bites were numerous and adjacent, inflammatory oedema of the skin was produced, giving the skin a marbled appearance ; these oedematous patches were more frequent on hairless parts or parts thinly covered by hair. In the horse the patches were most often seen on the head, penis and sheath, whereas in cattle they occurred most frequently in the dewlap, and at times occasioned stiffness and great difficulty in walking. The eyelids were often so swollen as to cause blindness. In mild cases there was uneasiness, inappetence and shivering. The temperature, pulse and respirations were increased, but these symptoms might disappear and the animals might recover if they were not bitten again. If, on the other hand, they were bitten again the condition became worse ; the temperature fell below normal, and cattle might be found in sterno-abdominal decubitus and die in six or seven hours. Severely bitten animals showed symptoms of asphyxia and might die in a few hours. In moderately severe cases the oedematous patches might persist for fifteen days. Human beings are also attacked by the insects.

II. T. discussed the research work that has been done on the Golubatz midge. The insect becomes active in spring and may be blown by the wind for 100–150 kilometres in five or six hours. Great swarms of the insects have the appearance of a black cloud in the sky, and it has been suggested that after a long journey on the wing they attack the animals to satisfy an intense thirst. The following numbers of deaths as a result of midge bites have been recorded :– in 1923—Rumania 16,474, Yugoslavia 2,330, Bulgaria 1,500 ; in 1934—Rumania 2,412, Yugoslavia 12,896, Bulgaria 93.

Attacked animals run for shelter, horses rear and pigs wallow in the mud or earth. Unshorn sheep stretch themselves out and scratch the ground with their noses. Severely bitten animals show inappetence and in ruminants this is usually followed by paralysis and tympany of the rumen. Occasionally diarrhoea is seen, and pregnant animals may abort. The secretion of milk is diminished or arrested altogether. Oedema of the glottis and vocal cords may result when insects penetrate the mouth. At P.M. examination the lesions seen may include serous, and at times haemorrhagic, infiltration of the subcutaneous and subserous tissues, mucosal haemorrhages, pulmonary oedema and traumatic broncho-pneumonia due to the presence of insects in the bronchi, endocardial and epicardial ecchymoses, haemorrhagic infiltration of the intestinal mucosa, and slight tumefaction of the spleen. These changes are probably due to the action of a poison injected by the insects, although its exact nature or the nature of the slight immunity conferred have not yet been definitely ascertained. The midges may be seen in the nasal cavities and various parts of the respiratory system.

III. A full description of the insect and its developmental stages. Various biological controls are mentioned, but the best of these is the fish *Acipenser ruthenus* which lives in the Danube and feeds on the larvae of the insect. B. calculated that the proportion of larvae killed by the fish is one million larvae per kg. of fish. It is suggested that the Danube should be stocked by these fish, reared scientifically, and that fishing should be prohibited during the spring months. Other controls are the insects *Dioctria longicornis* and *Chirosia crassiseta* and (of the male) the plant *Parietaria officinalis*. Swallows, too, devour innumerable quantities of the flies, and at the same time indicate the time and place of hatching.

Control by insecticides, toxic oils and various poisons in solution is also suggested. Certain drugs were tested to protect and treat the animals, the best being mixtures of vaseline and petroleum and a solution of naphthalene in paraffin oil.—A. L. Wilson.

Anon. (1940). **The Control of Sheep Tick.**—*J. R. agric. Soc.* **100.** Pt. III. 86-89. 1 table.

In trials carried out by Stewart in Northumberland two improved anti-tick dips containing arsenic, derris and wool grease, and a derris powder gave sheep useful protection against the tick for about a fortnight, but in all trials the powder was more effective than the dips. The derris powder was found to be a convenient and effective preventative of tick infestation in lambs, but care must be exercised to prevent the dust from entering the nostrils and eyes as it is irritating to mucous membranes. Lamb mortality on one tick-infested farm was greatly reduced by dipping and dusting. 25 out of 28 unacclimatized sheep introduced to a tick-infested pasture developed high temperatures, which seem to have been due to tick-borne fever. Uleron and prontosil seemed to shorten the febrile phase of the disease.—Walter Moore.

OSWALD, B. (1939). O do sada poznatim metodama za uništavanje krpelja (Ixodoidea). [**On Recent Methods of Tick Eradication**].—*Jugoslov. vet. Glasn.* **19.** 471–481. 1 diagram. [Numerous refs.] [English summary].

This is a lecture, delivered at a meeting of the Veterinary Medical Association of Yugoslavia in which the author described methods of tick eradication in the countries of the British Empire and in the United States. For the control of ticks in Yugoslavia it is very desirable that a single standard tick-destructive agent and a standard type of dipping tank should be made available on a large scale. There is in existence an Animal Parasitic Diseases Control Act which includes a tick eradication scheme. The act is not yet in operation and O. emphasizes the importance of putting it into force at once. He also advocates the establishment of a veterinary parasitology laboratory from which could be regulated a tick eradication scheme embracing the whole country.

PARASITES IN RELATION TO DISEASE [HELMINTHS]

ACKERT, J. E. (1939). **Factors in the Resistance of Chickens to Parasitic Worms.** —*Proc. 7th World's Poult. Congr., 1939.* pp. 265–267. [11 refs.] Washington, D.C.: U.S. Dep. Agric. [In English].

The resistance of chickens to helminths, especially to *Ascaridia lineata*, may be influenced by a number of factors [see *V. B.* **8.** 586]. In an experiment involving 140 chickens, it was evident that the inclusion in the diet of animal proteins such as meat meal and skim milk, increased the growth rates and resistance to *Ascaridia lineata* of the chickens, but in those fed on a ration in which peanut meal replaced meat meal as a protein supplement, growth was slower, with a significant increase in the number and size of *A.l.* carried.

The supply of vitamin D, in four experiments with 150 chickens, did not appear to affect the parasitism. As a result of work done by himself and others between 1926 and 1931, to which references are given in this paper, A. considered that vitamins A, B and D would protect chickens against the harmful effects of roundworms.

Experimental observation over a period of two years, on a total of 1,351 chickens of different breeds, suggested that the heavy breeds (Rhode Island Reds and Plymouth Rocks) were more resistant to *A.l.* than the lighter breeds (White Leghorns and White Minorcas); within these breeds, resistant as well as susceptible strains were, however, encountered.

Another factor of importance is age. Chickens one month old were found to be very susceptible to heavy infestations of *A.l.*, but these worms had practically no effect on chickens 3–4 months old.

The food of *A.l.* is also discussed [see also *V. B.* **10.** 431].—S. G. IYER.

TENHAEFF, C., & FERWERDA, S. (1939). De echinococcosis bij het varken in Nederland. [**Porcine Echinococcosis in Holland**].—*Tijdschr. Diergeneesk.* **66.** 331–344. 2 tables. [10 refs.] [English, French and German summaries].

Statistics are given in a table of the incidence of echinococcosis in swine slaughtered at abattoirs in the 11 provinces of Holland between 1923 and 1937. This shows that the incidence has decreased most for Friesland and North Holland. To account for the varying incidence, the authors suggest that the most successful control has been achieved in provinces where the meat inspection law has been most strictly enforced. Where this has been done all infected meat has been destroyed in special destructor plants and the home killing of pigs has been forbidden.

—JAC JANSEN (UTRECHT).

ORLOV, N. P., ALIKAEV, V. A., PRISELKOV, A. M., RODIONOV, V. G., GUR'EVA, A. M., & SAMARTSEV, A. S. (1937). Nablyudeniya nad biologieĭ Dictyocaulus filaria. [**Observations on the Biology of** *Dictyocaulus filaria*].—*Papers on Helminthology, commemorating 30 year Jubilee of K. I. Skryabin.* pp. 440–448. 1 table. Moscow: Lenin Acad. Agric. Sci.

It was found that pre-infective *D.f.* larvae brought into contact with river or swamp water, liquid manure, or water mixed with bile, perished within three days. In distilled water the larvae lived 20 days, during which they underwent two moults. The moulting process is described in detail. Ova were hatched after 24 hours in distilled water containing a few drops of bile and after 96 hours in pure distilled water. The ova, however, which hatched in liquid containing bile perished within six days, whereas those hatched in distilled water developed normally. Larvae kept in water at about 0°C. were more mobile and had a lower death-rate than those kept at room temperatures. Moults occurred at the same intervals in both cases.

Larvae one, three and five days old all perished if kept dry for 24 hours. One-fifth of infective larvae, however, revived after desiccation if moistened again. Resistance to hot water, and to creolin, formalin and chlorine at various temperatures and in various concentrations was also tested, both in respect of isolated larvae and of faeces. The data obtained are too numerous to be quoted here.

Examination of pasture artificially infected by scattering of faeces containing *Dictyocaulus* larvae, showed that swampy or wet pastures were favourable to the survival of the larvae.

It is stated that the number of larvae found on the herbage between 7 and 9 a.m. was seven times greater than the number found at noon and 2½ times greater than the number found between 7 and 8 p.m. 89·2% of the larvae were found near the roots of the herbage, 9·6% on the stems and only 1·2% near the tips. The distribution of the larvae on the different pasture plants was not uniform; 75% were found on *Chenopodium*, 15% on *Artemisia*, 9·5% on leguminous and none on graminaceous plants.—E. MARTIN.

MORGAN, D. O., & CORNER, H. H. (1939). **Helminth Parasites in Lambs on a Scottish Border Farm.**—*J. Helminth.* **17.** 203–210. 1 table. [7 refs.]

The system of sheep-raising in the border counties is very conducive to heavy helminth infestations, since the pastures are almost continuously grazed by the stock. A group of 32 gimmers with 64 twin lambs was put on a 20-acre field in April. In August, 20 lambs were killed, their live weights having been noted at the beginning and end of the experiment, and counts were made of the intestinal parasites in each. The majority showed a fairly high count; the numbers varied from 1,000–3,000, although all lambs had grazed on the same pasture and were approximately the same age. *Ostertagia circumcincta* and *Nematodirus filicollis* were the two species found in the largest numbers. *O. trifurcata* was found in all lambs, but in fewer numbers. The pathogenicity of the parasites is discussed.
—M. L. BINGHAM.

ORTLEPP, R. J. (1939). **Can Hares and Rabbits Act as Hosts of Sheep and Goat Bankrupt** (*Trichostrongylus spp.*) **Worms in South Africa?**—*J. S. Afr. vet. med. Ass.* **10.** 166–169. 2 figs. [5 refs.]

A number of references are quoted of natural infection of rabbits with species of trichostrongyles from sheep. O. found a species of *Trichostrongylus* in Cape Grey hares which proved to be *Trich. pietersei* originally described from sheep and goats. Some experiments were carried out with *Trich. colubriformis*, larvae from infected sheep being used for infecting rabbits, and sheep being subsequently

reinfected from the rabbits. Owing to the rarity of this hare, O. does not consider that it is of any importance as a host in South Africa. The article concludes with some notes on *Trich. pictersei*.—E. M. ROBINSON.

TAYLOR, E. L. (1939). **Technique for the Estimation of Pasture Infestation by Strongyloid Larvae.**—*Parasitology*. **31.** 473–478. 1 fig. [5 refs.]

The technique is a modification of the Baermann technique and enables the number of larvae per lb. of herbage to be ascertained. The pasture to be examined is traversed by two collectors, each of whom takes 1,000 separate grass samples. Each collection is then mixed thoroughly and divided into two equal parts by weight. Each of the four samples thus obtained is put into a large bucket of water, into one of which are stirred 1,000 trichostrongyle larvae. After two hours the grass is strained out; the water is next passed through a 60-mesh screen and allowed to sediment overnight. The supernatant water is reduced by siphoning, etc., and the muddy sediment is poured evenly onto a piece of Whatman no. 1 filter paper resting on several thicknesses of blotting paper. When the shining wetness has disappeared the filter paper is placed, sediment side down, into a Baermann separation apparatus large enough to allow the water to rise at least ¾ in. above the screen, so that the filter paper need not rub on the surface of the gauze.

The larvae collected are examined and counted. The number of larvae per sample can then be calculated, by comparison with the number recovered from the bucket to which 1,000 larvae were added, according to a simple formula.

It is stated that the technique is rather slow, eight or nine days being required for the whole process if the maximum number of larvae are to be recovered. It may, however, be speeded up by reducing the time in the Baermann apparatus to two days. From the data collected, it has been estimated that, towards the end of summer, a heavily infested pasture where sheep are grazing may carry 500 larvae per lb. of pasture, and one where sheep affected with severe parasitic gastritis are grazing, may carry between 1,000 and 2,500 larvae per lb. An average sheep pasture may carry about 200 larvae per lb.—A. L. WILSON.

GRIEDER, H. (1938). Filaridae, Filariosis und Mikrofilariosis bei verschiedenen Säugetieren. [**Filarial Infections in Mammals**].—*Schweiz. Arch. Tierheilk.* **80.** 485–490. 4 figs. [1 ref.]

Observations were made at the Institute of Veterinary Pathology, University of Zurich, on material collected in Switzerland. *Filaria kitti* was found in the abdominal cavity of a koypu (*Myocastor coypus*), *Setaria equina* in the abdominal cavity of a horse, and *Setaria labiato-papillosa* in the abdominal cavity of a roe deer destroyed because of cerebral haemorrhage caused by a *Cephenomyia stimulator* larva. Microfilariae were found in five Brazilian marmosets, three of which died from miliary tuberculosis, while the other two showed only anaemia and cachexia. The microfilariae were present in the blood in great numbers, but adults could not be found in the abdominal cavity, the lymph nodes, the lymph stream or the eyes.—V. CHLÁDEK (PRAGUE).

IMMUNITY

RIDER, J. R. (1940). **The Relation Between Skin Measurements and the Character of the Swelling in Eleven Hundred Double Intradermal Tuberculin Tests.**—*Vet. J.* **96.** 154–159. 2 tables.

Observations on an examination of over 1,100 cattle, tested by the double

intradermal method with a synthetic medium tuberculin, have shown that a significant relationship exists between skin measurements and the character of the swelling. Particular attention was paid to accurate measurements of the fold of the skin by means of a screw micrometer gauge reading to 0·01 mm.

When the actual increase in measurement was correlated with the nature of the swelling (negative—sharply demarcated, positive—diffuse form), it was found that in 93·4% of negative cattle the increase at the 48th hour did not exceed 2 mm., while at the 72nd hour 90·6% were not in excess of 3 mm. In positive cattle, on the other hand, 89·8% advanced beyond 3 mm. at the 48th hour, while 91·1% showed an increase exceeding 5 mm. at the 72nd hour.

There was an atypical group containing 9·4% non-reactors and 8·9% reactors in which the total increase fell between 3 mm. and 5 mm. Subsequent tests showed that in these atypical cases the majority gave a negative result at a subsequent test, but in a small proportion the animals were still indefinite or positive at one of the following tests.—R. E. Glover.

Seibert, Florence B., & DuFour, Emma H. (1940). **Methods of Preserving the Tuberculin Protein.**—*Amer. Rev. Tuberc.* **41.** 471–480. 4 tables, 4 graphs. [8 refs.] [Authors' summary copied *verbatim*].

Purified Protein Derivative (PPD) preparations can be made repeatedly with constant potency and it has been shown that such preparations can be kept as a one per cent solution, made in saline containing 0·5 per cent phenol, for at least five years without loss in potency. Moreover, no change has been detected in the ultracentrifuge sedimentation curves of tuberculin solutions due to preservation with 0·5 per cent phenol or 1 : 10,000 merthiolate.

The methods of drying from the frozen state and in high vacuum, that is, the " lyophile " or " cryochem " processes, proved to be highly effective for preserving the purified tuberculin protein, even in the high dilutions used for diagnosis (0·000,2 mg. per cc.), resulting in no loss in potency, provided a buffered diluent was present. When saline was substituted for the buffered diluent a loss in potency occurred.

No change was detected in the ultracentrifuge sedimentation diagrams after drying *in vacuo* or freezing a molecularly homogeneous tuberculin protein fraction. Furthermore, no change was found in the electrical mobility properties, as observed in the Tiselius electrophoresis apparatus, as a result of the " cryochem " process.

Jacobs, J. L., & Sommers, S. C. (1939). **The Specificity of Formolized Proteins.** —*J. Immunol.* **36.** 531–541. 3 tables. [8 refs.]

Formolized preparations were made from normal blood sera of the horse, ox, rabbit, human being, chicken, duck and turkey which were dried over concentrated sulphuric acid in a desiccator for 12–18 hours. The powdered residues were redissolved in a quarter the original volume with distilled water and made up to the original volume with formaldehyde solution ; the resulting solution then contained about 30% formaldehyde and 7% protein. After standing at room temperature for 24 hours the free formaldehyde was destroyed with an excess of ammonia and the base immediately neutralized with normal HCl. The clean solutions were then made up to twice serum-volume with physiological saline and stored in an ice-box. It was found that specific alterations following formolization could be demonstrated only in certain reactions occurring between antigens and antisera from related species ; these resembled alterations produced by heating proteins rather than the more marked changes following halogenation or nitration. A comparison of formolized antigens and antisera prepared by different methods

suggested that secondary changes leading to gelatinization play an important role ; hence, faint traces of turbidity in test antigens may be associated with falsely positive reactions.—R. ALLCROFT.

HANKS, J. H., & EVANS, B. (1940). **The Action of Serum, Cells and Blood on Acid-Fast Bacteria in vitro. I. Absence of** *in vitro* **Bactericidal Power against Human Tubercle Bacilli or Timothy Bacilli in the Serum-Leucocyte Mixtures or the Blood of Normal and Immunized Rabbits. II. Failure to Demonstrate Bactericidal Power in Various Bloods. The Relative Advantages of a Solid Medium and of Liquid Blood in Demonstrating the Viability of Bacilli in Blood.**—*Amer. Rev. Tuberc.* **41.** 605–619 and 620–636. 15 tables. [Numerous refs.] [Authors' summaries copied *verbatim*].

I. By the application of a standard immunological bactericidal power test, it was not possible to show that serum-leucocyte mixtures from normal, infected or immunized rabbits possessed a bactericidal action on human tubercle bacilli. Likewise, the blood of normal or immunized rabbits was incapable of sterilizing the most dilute suspensions of saprophytic timothy bacilli.

II. Cultivation of human, bovine and avian tubercle bacilli from rabbit's blood on egg-yolk-glycerol-water medium permitted the demonstration of only 1 per cent, 3 per cent and 17 per cent, respectively, of the viable bacilli. Cultivation of timothy bacilli after the same interval in blood produced colonies from 86 per cent of the bacilli. The incubation of the liquid bloods containing tubercle bacilli in the presence of a small amount of Long's medium permitted definitely better recovery of the bacilli. This method showed that the bacilli had not been killed by the action of the serum and leucocytes in blood.

BURNET, F. M., FREEMAN, Mavis, JACKSON, A. V., & LUSH, Dora. (1939). **A Study of Heterologous Antibodies in the Serum of Poliomyelitis Patients.** —*Med. J. Aust.* Aug. 5th. 198–206. 10 tables. [19 refs.]

Seventy specimens of serum from patients with poliomyelitis were examined for antibodies against herpes and swine influenza and for diphtheria and staphylococcal antitoxins. There was no evidence that any of the heterologous antibodies in these sera were in any different proportion from those which would be found in a comparable group of sera from normal people. Herpes antibody and diphtheria antitoxin were both found much more frequently in children from crowded industrial suburbs than in those from better class areas, but there was no relation between swine influenza antibody or staphylococcal antitoxin and social environment. An apparent correlation between the presence of poliomyelitis antibody and diphtheria antitoxin was attributed to similar environmental conditions favouring the development of each of these.—W. I. B. BEVERIDGE.

DISEASES, GENERAL

SHOPE, R. E. (1939). **Complex Infections.**—*Arch. Path.* **27.** 913–932. [Numerous refs.]

In this review S. discusses the manner in which certain virus infections differ from uncomplicated bacterial diseases. The discussion is confined to " complex infections ", *i.e.*, infectious diseases in which more than one agent plays an essential causal role.

The conditions which are considered in detail are :– rugose mosaic of potato, streak of tomato, tulip breaking, blackhead of turkeys, swine influenza, type 3 coryza of fowls and infectious myxomatosis of rabbits. It is suggested that unless

investigators keep in mind the possibility that two or more factors are at work, the exact nature of certain diseases may be overlooked.—R. E. Glover.

Rajčević, M. (1940). **Bovine Tuberculosis and Brucellosis in Jugoslavia.**—*Mon. Bull. agric. Sci.* **31.** 173T–178T. 1 table.

In Yugoslavia, TB. control is left to private initiative except in cases where the State deems it opportune to make use of existing legislation for suppressing the disease. Figures published in 1939 by Debelic are referred to [see *V. B.* **9.** 365]. Figures given in a table which presumably represents the herds in which the tuberculin test was used between 1930–37 show the number of reactors in the various provinces of Yugoslavia; they show that in some of the more important herds, which have the largest number of animals, the percentage of reactors ranged from 38–10. The herds of the Simmenthal Breed Society showed 1–3% reactors, while among the peasant stock it was as low as 0·4%.

R. records the results of the tuberculin tests carried out at the clinic of the veterinary faculty at Zagreb from October, 1926 to December, 1938 on 6,824 cattle: 3 were positive and 7 doubtful (less than 0·74%). There are no statistics available for bovine brucellosis although the disease has been recognized in Yugoslavia since 1924. On peasant farms its occurrence is rare.—J. A. Griffiths.

Malbrant, R. (1940). I. Existence de la leishmaniose canine au Congo français. II. Ankylostomiase canine et formol-gélification. **[I. Canine Leishmaniasis in the French Congo. II. Canine Ancylostomiasis and the Formol-Gel Test].**—*Bull. Soc. Path. exot.* **33.** 12–14. [3 refs.]

Canine leishmaniasis has not previously been reported from French Equatorial Africa, possibly because it has existed in a mild form, but two cases of human leishmaniasis have occurred. Three cases in dogs are now recorded associated with eczema but not with ulceration of the skin. The sera gave positive formol-gel reactions, and leishmania were demonstrated in skin scrapings. Formol-gel tests were carried out on dogs infected with ancylostomes and several of the sera gave a gel in 1–6 hours but there was no opalescence. Whilst the sero-flocculation test was positive in two of the three leishmania cases, it was negative in all the ancylostome cases. Skin scrapings in the latter cases were also negative.—U. F. R.

I. Winterhalter, M. (1939). Razudbeni nalazi kod uginulih konja razuđenih u toku godina 1928–1938 u Zavodu za patološku anatomiju Veterinarskog fakulteta u Zagrebu. **[Results of Autopsies of Horses made during 1928–1938 at the Institute for Pathological Anatomy of the Veterinary College at Zagreb (Yugoslavia)].**—*Jugoslov. vet. Glasn.* **19.** 169–174. 8 tables, 2 diagrams.

II. Winterhalter, M. (1939). Razudbeni nalazi kod uginulih goveda razuđenih u Zavodu za patološku anatomiju Veterinarskog fakulteta u Zagrebu u toku 1928–1938 god. **[Results of Autopsies of Cattle made during 1928–1938 at the Institute for Pathological Anatomy of the Veterinary College at Zagreb (Yugoslavia)].**—*Ibid.* 357–360. 1 table, 1 diagram.

III. Winterhalter, M. (1939). Razudbeni nalazi kod uginulih svinja razuđenih u toku 1928–1938 godine u Zavodu za patološku anatomiju Veterinarskog fakulteta u Zagrebu. **[Results of Autopsies of Swine made during 1928–1938 at the Institute for Pathological Anatomy of the Veterinary College at Zagreb (Yugoslavia)].**—*Ibid.* 525–527. 1 table, 1 diagram.

These are statistical lists showing the percentage figures of various diseases encountered. They comprise a total of 714 horses, 505 cattle and 1,440 pigs.
—B. Oswald (Novi, Yugoslavia).

BUSHNELL, L. D., & TWIEHAUS, M. J. (1939). **Poultry Diseases, their Prevention and Control.**—*Bull. Kans. agric. Exp. Sta.* No. 284. pp. 125. 38 figs., 4 tables, 1 appendix. [Numerous refs.]

The bulletin is divided into sections on :– essentials of hygiene and sanitation ; general discussion on diseases, including a scheme to aid in the diagnosis of poultry diseases and P.M. examination, details of which are given ; deficiency diseases ; diseases due to viruses ; diseases due to bacteria ; diseases due to higher fungi ; parasitic diseases, including protozoan infections ; miscellaneous diseases, in which are included poisoning ; vicious habits of birds, and the various causes of chick mortality. There is also an appendix containing miscellaneous information, such as the normal temperatures of poultry, a dosage table of drugs for adult fowls, and there are also some notes on the stained antigen, rapid, whole blood test for *Salmonella pullorum* infection. The oral form of fowl pox is dealt with as though it were due to a separate causal agent.—S. G. IYER.

MARBLE, D. R. (1939). **Results of Five Years of Selection for Viability in Poultry Flocks.**—*Proc. 7th World's Poult. Congr., 1939.* pp. 46–48. 2 tables. [5 refs.] Washington, D.C. : U.S. Dep. Agric. [In English]. [Author's summary copied *verbatim*].

Adult mortality in poultry flocks at the Pennsylvania State College was extremely high during the 6-year period 1927–32. This high mortality was due to various forms of the fowl paralysis complex and included iritis, paralysis, and tumors. Since 1932 all breeders have been selected on the basis of family viability, with egg production, egg size, body weight, and hatchability as secondary factors. During the 5 years of selection on this basis, more than 4,900 adult birds of two different breeds have been placed in laying quarters and their viability on a family basis studied for a 365-day period.

Management conditions and rations have been the same during this 5-year period. The results reported have been accomplished by selection from within the strains.

The laying-stock mortality during these 5 years of selection has been decreased from 39·8 percent in the Single-Comb White Leghorns for the 6-year average for 1927–32 to 20·1 percent in 1937. The decrease in the Barred Plymouth Rocks has been from 48·7 percent for the 6-year average to 24·6 percent in 1937. Cases of paralysis, tumors, and leucosis still constitute a large proportion of the mortality, but the percentage of families showing high viability has increased from year to year.

The data indicate that losses from fowl paralysis can be decreased gradually by the use of breeders from families that show resistance to the disease and by the use of hen breeders in preference to pullet breeders.

HUTT, F. B., BRUCKNER, J. H., & COLE, R. K. (1939). **Reduction of Mortality in Fowls by Breeding.**—*Proc. 7th World's Poult. Congr., 1939.* pp. 49–51. 3 tables. Washington, D.C. : U.S. Dep. Agric. [In English]. [Authors' summary copied *verbatim*].

Results of 3 years of breeding to increase viability in the fowl are reported. Beginning in 1935 with stock in which no selection for resistance to disease had been done, the procedure has been to select breeders from families with lowest mortality under natural exposure to disease-producing agencies, and, after the first year, to use as far as possible birds proved by progeny test to transmit more than average resistance to disease. No culling has been done within families retained and all birds are tested to 500 days of age. Use of families with high

incidence of neurolymphomatosis, leucosis, or other neoplasms has been avoided. All birds that died are diagnosed.

In unselected stock hatched in 1935, mortality from the time of housing to 500 days of age was 64 percent. In the first selected generation, in 1936, the corresponding figure for the period from 160 to 500 days of age was 54 percent. Females of this stock outcrossed in 1936 to males of a strain bred for high viability produced progeny in which mortality was only 34 percent during the same period. In contrast, the death rate in stock selected for susceptibility to disease was 70 percent in the first generation.

In the second selected generation, hatched in 1937, mortality from 160 to 500 days of age was 50·3 percent in the resistant line, 69·0 percent in the susceptible one, and 44·1 percent in the outcross line. The birds that died in the resistant line lived 7 weeks longer than those that died in the susceptible line. Offspring of males used in 2 consecutive years were consistently resistant or consistently susceptible in both years. The incidence of neoplasms in the second generation was 19 percent of all birds alive at 160 days in the resistant line, but 36 percent of all such fowls in the susceptible line.

MARBLE, D. R. (1939). **Breeding Poultry for Viability.**—*Bull. Penn. agric. Exp. Sta.* No. 377. pp. 38. 7 figs., 15 tables. [9 refs.]

Consequent on the occurrence of heavy losses of adult birds in laying flocks in Pennsylvania over several years as a result of deaths and culling, primarily on account of the " fowl paralysis complex ", investigations were undertaken at the Penn. State College Poultry Farm concerning the breeding aspect of the problem. As a result of five years of rigid selection of breeders from the most viable families of single comb White Leghorns and Barred Plymouth Rocks, M. claims to have lowered the mortality by raising families of birds with increased viability, and at the same time to have maintained a satisfactory level of family average egg production and other breeding characteristics of economic importance. Whilst, however, the mortality in the laying flock was reduced significantly and the rearing flock showed improvement of viability, there was slightly decreased chick viability. It is important to consider the family history when selecting stock.

It is usually believed that one of the contributing factors to heavy mortality in high-laying flocks is the continued selection of laying birds for high egg production, but the data obtained from this study seem to point to the contrary. M. prefers to conclude that the egg production of the hen will have no influence upon the mortality of the progeny.

It is suggested that on farms subject to fowl paralysis, breeding should be from hens instead of pullets owing to the low incidence of the disease in adult birds. [This is in agreement with the opinions of many workers that it is possible to reduce mortality and increase longevity in the stock raised each year by breeding only from yearling and older hens.] The subsequent adult mortality of pullets showing the " gray-eye " condition (iritis form of fowl paralysis) was greater than that of pullets with normal eyes, but the influence of the " gray-eye " condition on egg production was insignificant.—S. G. IYER.

SHILLINGER, J. E. (1939). **Relationship of Diseases Common to Game Birds and Domestic Poultry.**—*Proc. 7th World's Poult. Congr., 1939.* pp. 241–243. [4 refs.] Washington, D.C.: U.S. Dep. Agric. [In English]. [Author's summary copied *verbatim*].

Difficulties in the attempts at artificial propagation of game species have brought to the attention of the would-be propagator a realization of the relationship of the parasites and diseases of these game species and those of domestic poultry.

In addition to the known diseases of domestic poultry that may be shared in common with game birds, diseases new to science have been found, some of which appear to be specific for certain species of game birds. Raising domestic poultry and game birds in close proximity frequently results in heavy losses of the game species as a result of their becoming affected with organisms harbored by the former.

Among the diseases of domestic fowls that are also infectious to game birds raised in captivity may be listed enterohepatitis, coccidiosis, pullorum disease, tuberculosis, chicken pox, and a long list of parasites, including the gape worm, the common ascarid, and the *Raillietina* species of tapeworm.

Game species do not possess the racial resistance to pollutions apparently inherent in domestic stock.

One of the basic principles in the guidance of game farmers is the maintenance of stock on sanitary floors and grounds away from all forms of domestic poultry.

I. Holman, H. H. (1940). **A Haematological Study of Horses Suffering from Grass Sickness.**—*Vet. Rec.* **52.** 195–200. 4 figs., 3 tables. [4 refs.]

II. Stewart, J., Gordon, W. S., & McCallum, Jennie W. (1940). **Grass Sickness in Horses—Biochemical Investigation.**—*Vet. Rec.* **52.** 237–243. 5 figs., 1 table.

I. Haematological studies are described of eleven acute fatal cases, three chronic fatal cases and two chronic non-fatal cases of grass sickness. Observations were made on the coagulation time, erythrocyte count, total and differential leucocyte counts, platelet count, erythrocyte fragility, specific gravity, corpuscular volume, viscosity and sedimentation rate.

The physical blood changes in all fatal cases suggested a progressive anhydraemia. In acute cases, rapid increase in the number of erythrocytes was characteristic. In chronic cases, however, dehydration occurred more slowly and there was a tendency towards readjustment to normal erythrocyte levels.

Changes in the leucocyte system resembled those of an infection or intoxication. In acute cases, there was a neutrophilic shift to the left and a complete eosinopenia. In mild chronic cases changes were intermittent and indefinite.

The blood changes were regarded as non-specific, and were those which would result from any complete obstruction of the bowel.

II. In a biochemical investigation carried out on the same subjects, preliminary estimations were made of blood sugar, inorganic and total phosphorus, haemoglobin, chlorides, preformed creatinine, amino nitrogen, non-protein nitrogen, albumin, globulin, fibrin, calcium, magnesium and potassium. The amount of each constituent usually tended to rise in cases of grass sickness. Chloride, however, showed a tendency to fall, while calcium, magnesium and potassium remained within normal limits. The constituents showing the greatest change were sugar, preformed creatinine, haemoglobin, phosphorus and non-protein nitrogen. Observations were made on serial blood samples from each type of the disease.

In a peracute case, sugar rose to 317·4 mg., non-protein nitrogen to 71 mg., amino nitrogen to 16·5 mg., total phosphorus to 40 mg., and haemoglobin to 22·6 g. per 100 c.c. Chlorides fell to 320 mg. per 100 c.c. The increases in sugar and non-protein nitrogen were approximately 200%, and in haemoglobin, 100%.

In a typical acute case, sugar rose progressively to 300 mg. per 100 c.c. Haemoglobin increased to 18·7 g. per 100 c.c. Non-protein nitrogen and total phosphorus rose steeply to 92 mg. and 38·8 mg. per 100 c.c. respectively. Chlorides fell to 350 mg. per 100 c.c.

The average subacute case seldom gave high sugar values, and a maximum of 150–200 mg. per 100 c.c. was not exceeded. Haemoglobin usually rose sharply immediately before death and reached about 20 g. per 100 c.c. The inorganic constituents of the blood remained very constant at the normal levels.

In chronic cases which died, the most striking change was a rise in non-protein nitrogen to as high as 133·5 mg. per 100 c.c. Sugar and haemoglobin usually remained within normal limits.

Chronic cases which recovered afforded similar results, except that the non-protein nitrogen increase was never so marked, and gradually disappeared as signs of recovery became evident.

It is concluded from both haematological and biochemical investigations that the blood picture of the peracute and acute types of grass sickness resembles that of an anhydraemia.—D. D. Ogilvie.

I. Gregory, T. S. (1939). **Foot-rot in Sheep.**—*Aust. vet. J.* **15.** 160–167. [10 refs.]

II. Belschner, H. G. (1939). **Foot-rot in Sheep.**—*Ibid.* 219–222.

I. G. calls attention to the confusion which has arisen owing to the application of the term " foot-rot " to several different affections of the sheep's foot. He advocates reservation of the term for the specific contagious disease in which the principal lesion is extensive separation of the horn from the soft tissues, usually without involvement of structures above the coronet. This condition may affect sheep of any age and more than one foot is often affected on one animal, both digits being involved on affected feet. It has been shown to be transmissible and outbreaks probably cannot occur in the absence of the specific infection.

In contra-distinction to true foot-rot as referred to above, G. describes a condition which has in the past been named " malignant foot-rot ", but for which he proposes the term " digital suppuration " or, for popular use, " foot abscess ". Young animals are rarely affected and the condition is usually confined to one digit. In the early stages of the disease pus is found imprisoned under the horn and in the absence of surgical interference this leads to infection of the deeper tissues of the foot, especially tendons and ligaments. Sinuses form which open around the coronet or between the digits and discharge copious amounts of pus. A pure infection with *Fusiformis necrophorus* is usually found, and this organism is considered, therefore, to be the causal agent. Outbreaks of " digital suppuration " are usually associated with excessively wet seasons.

" Suppurative cellulitis " is the term applied to a condition which affects the skin of the feet or legs. It commences as a dermatitis and, if untreated, goes on to suppurative cellulitis. *F. necrophorus* is also associated with this condition.

Contagious vesico-pustular dermatitis (contagious ecthyma) when involving the feet has also been confused with foot-rot by some writers.

In addition to these distinct diseases, various forms of trauma may also be confused with foot-rot.

II. This article is a discussion of I. B. recognises the two principle foot affections, true foot-rot and " digital suppuration ", and agrees with Gregory's differentiation and clinical descriptions. He recalls, however, having seen large outbreaks of foot-rot on properties where the disease had not been observed for at least several years previously and where there was no apparent introduction of infection from outside sources. He does not, therefore, accept it as proved that foot-rot cannot arise spontaneously under suitable seasonal conditions.

—W. I. B. Beveridge.

I. HOLTH, H. (1939). Neuere Forschungen über die spezifischen Infektionen des Genitalapparates des Rindes. [**New Research on Specific Infections of the Genital Organs of Cattle**].—*Rep. 13th int. vet. Congr. 1938.* **1.** 594–595. [In German].

II. RIEDMÜLLER, L. (1939). Der seuchenhafte Frühabortus und der Bläschenausschlag des Rindes. [**Contagious Abortion and Vesicular Exanthema in Cattle**].—*Ibid.* 596–608. [Numerous refs.] [In German ; English, French and Italian summaries].

I. The control of contagious abortion began in Norway in 1912, but systematic blood testing and financial assistance from the State were initiated in 1935. During that year, 131,752 blood tests were carried out, 72,760 in 1936 and 32,948 in 1937. The results achieved by 1937 were eminently satisfactory, since 2,648 herds representing 91% of the total were free or practically free from infection while in the remaining 142 herds in the country infection was slight.

II. R. gives an account of investigations into the epizootiology and clinical symptoms of trichomonas infection and of granular vaginitis in cattle. Inoculation of pure culture of trichomonas did not produce symptoms of tumefaction of the vulva or suppuration of the vaginal mucous membrane of the cow, or evidence of pain and tumefaction of the penis of the bull. On the other hand, catarrh of the uterine and vaginal mucous membrane and the occurrence of oestrus, abortion and pyometra were frequently found. R. suggests that the pathogenicity of trichomonas under natural conditions is associated with some predisposing factor.

Infectious vaginitis was found in three breeding establishments, and the prominent symptom was occurrence of oestrus. The cause of this condition was a filtrable virus.—S. J. EDWARDS.

BLAKEMORE, F. (1939). **Joint-Ill (Polyarthritis) of Lambs in East Anglia.**—*Vet. Rec.* **51.** 1207–1219. 1 fig., 1 table. [9 refs.]

A disease of lambs 7–14 days old is described. It was characterized by lameness and rapid emaciation with lesions of suppuration of joints, synovial bursae and tendon sheaths, but very rarely by other pyaemic changes ; it was sometimes complicated by a vegetative endocarditis. A particular type of non-haemolytic streptococcus, antigenically related to Lancefield's Group C, was constantly isolated from affected lambs, and serologically related streptococci were isolated from the tail wounds of six out of 12 lambs showing joint-ill symptoms after docking.

The intravenous injection of several young lambs with broth cultures of this organism readily reproduced the disease. Soaking of the umbilicus of three lambs shortly after birth, and exposure of the docked tail surface of three lambs to cotton wool soaked with culture, failed to cause infection.

Pregnant ewes were injected with culture, some intravenously and some by introduction into the cervical canal, in order to ascertain if prenatal infection could be set up. The streptococcus was recovered in pure culture from the blood and organs of the dead twin lambs of one of three ewes infected by the intravenous route. Eight ewes were infected by the vaginal route and a lamb of one of them developed joint-ill due to the streptococcus.

Twenty-six out of 35 lambs affected with joint-ill completely recovered after oral treatment with several daily doses of 1·5 g. of sulphanilamide.

In the ensuing discussion LYLE-STEWART described pyaemic polyarthritis of lambs due to *Fusiformis necrophorus* infection of the navel and to staphylococcal infection following tick bites.—R. O. MUIR.

I. SCHROEDER, F. (1939). Porphyrie der Knochen. [**Porphyria of the Bones**]. —*Z. Fleisch- u. Milchhyg.* **50.** 64.

II. FOURIE, P. J. J. (1939). Erbliche Porphyrinurie des Rindes (" Rosa Zahn ") mit besonderer Berücksichtigung ihrer fleischbeschaulichen Bedeutung. [**Hereditary Porphyrinuria (" Pink Tooth ") in Cattle and its Significance in Meat Inspection**].—*Ibid.* 64–65. 3 figs. on 1 plate. [10 refs.]

I. A case is briefly described in which the teeth and osseous skeleton of a 12-year-old cow were of a reddish-brown colour.

II. This condition, known under various names including ochronosis, osteo-haemochromatosis and haemochromatosis, has been called by F. " pink tooth " or " bovine congenital porphyrinuria ". The term " ochronosis " is incorrect since it refers to an entirely different condition occurring in man which is related to melanin deposition. In new-born calves affected with the disease the teeth are pink, the colour usually becoming darker with age. Cartilage and fibrous connective tissue are not macroscopically affected although the presence of porphyrins can be demonstrated microscopically. All the bones are reddish brown in colour. Affected animals are photosensitive in the regions where the skin is not pigmented and occasionally the pigmented areas are also affected by very intense sunlight in emaciated animals.

The pathogenesis has not been explained, although the porphyrin deposition is related to haemoglobin metabolism. The disease is transmitted as a recessive character.—E. G. WHITE.

SEYFARTH, Martha. (1940). Eigenartige Veränderungen in den Speckschichten des Schweines. [**Unusual Changes in the Fatty Tissue of the Pig**].—*Dtsch. tierärztl. Wschr.* **48.** 110–112. 5 figs. [2 ref.]

Two unusual conditions, involving the subcutaneous adipose tissue in the pig, are described. The first consisted of marked vascularization and sclerosis, producing a yellowish-red marbled appearance visible by naked eye examination; there were no other pathological changes in the carcass, and the cause of the condition was not discovered. The second condition consisted of multiple small abscesses throughout the subcutaneous adipose tissue of the neck, shoulder, back and abdomen. *Staphylococcus aureus* was isolated from the lesions. There is no mention of other lesions in the carcass.—E. G. WHITE.

KRESS, F. (1940). Fötale Mediaverkalkungen beim Pferd. [**Sclerosis of the Tunica Media in the Blood Vessels of an Equine Foetus**].—*Wien. tierärztl. Mschr.* **27.** 49–57. 8 figs. [Numerous refs.]

Extremely widespread calcification of the tunica media, involving the pulmonary artery and its larger branches, is described in an eight-month-old equine foetus which was aborted without manual assistance and was otherwise normal. The changes began at the origin of the pulmonary artery, and appeared macroscopically as whitish, elongated or rounded plaques. Histologically, the calcium salts were deposited mainly in the tunica media, but to a lesser extent also in the intima, along the course of the elastic fibres. Hydrochloric acid dissolved the salts without evolution of gas, a fact which indicated that the substance was probably mainly phosphate rather than carbonate. Although a similar condition *in utero* has been described in the human foetus, no record of its occurrence was found in the literature dealing with animals.—E. G. WHITE.

STEYN, H. P., QUINLAN, J., & JACKSON, C. (1939). **A Skin Condition seen in Rhodesian Ridgeback Dogs : Report on Two Cases.**—*J. S. Afr. vet. med. Ass.* **10.** 170–174. 1 fig. [1 ref.]

The Rhodesian ridgeback dog is subject to a peculiar skin growth for which the name trichiasis spiralis has been coined. Two cases of this condition are

described in pups from the same litter. In one case, the lesions were in the middle line of the back at the base of the neck, and in the other, just in front of the root of the tail. The lesions were difficult to remove surgically and were found to be cord-like structures consisting of tubular growths, somewhat funnel-shaped. These tubular growths were lined with epithelium and contained matted tufts of hair and sebaceous matter. On histological examination the lesion had all the features of a dermoid cyst, but it was actually a sinus and could not be described as a cyst. The condition is apparently congenital. In view of the character of the lesions, the name " dermoid cyst " is suggested for it.—E. M. Robinson.

Krembs, J. (1939). Infektiose Laryngitis und Enteritis, eine bisher unbekannte Katzenseuche. [**Infectious Laryngo-Enteritis of Cats**].—*Dtsch. tierärztl. Wschr.* **47.** 468.

In and around Munich there has appeared during the last four years an infectious disease of cats distinct from feline distemper and laryngitis. It is a highly fatal laryngo-enteritis, affecting cats of all ages and both sexes. The incubation period is 4–8 days and the duration is one-half to 3 days. Symptoms exhibited are weakness, anorexia, fever, and vomiting of greenish-yellow mucus. Deep coma usually precedes death.

The P.M. findings are catarrhal or diphtheroid laryngitis, tonsillitis and gastro-enteritis, simple acute lymphadenitis of the mesenteric nodes and an acute or sub-acute glomerulo-nephritis. The renal lesion is usually recognizable only on microscopic examination. Morbid changes which occur in the trachea, lung, liver and spleen are inconstant. Chronic lesions—laryngitis, tonsillitis and enteritis —have also been encountered.

The results of transmission experiments indicate that infection may occur through nasal and intestinal routes. Though attempts to produce the disease in rabbits, g. pigs, rats, silver foxes, hens and pigeons were unsuccessful, raccoons were infected by feeding them with diseased cats.—J. W. Whittick.

I. McPhee, H. C., & Buckley, S. S. (1934). **Inheritance of Cryptorchism in Swine.**—*J. Hered.* **25.** 295–303. 2 figs.

II. Korovetskaya, N. N. (1938). Izuchenie nekotorykh nasledstvennykh urodstv u svineĭ. [**A Study of Some Hereditary Defects in the Pig**].—*Usp. zootekh. Nauk.* **5.** No. 2. 19–39. 16 figs., 11 tables. [19 refs.] [English summary].

I. This is a report on the occurrence of cryptorchidism in an inbred strain of Chester White swine developed by continuous brother-sister mating.

Evidence is adduced to show that the defect is hereditary. Both affected and seemingly normal boars were found to transmit it. Hence it is concluded that apparently normal boars must be either heterozygous for the recessive genes involved, or free from them altogether. The character being obviously sex-limited, sows can be either homozygous or heterozygous for the genes or else entirely free from them, *i.e.*, homozygous normals. Only by breeding tests can the genetic quality of the sows relative to the character be estimated, but even then it cannot be established with certainty.

In cryptorchid pigs of this series there was a tendency to sexual precocity.

The conclusion is drawn that cryptorchid boars, even if fertile, should never be used as sires and that cryptorchidism can be eliminated with certainty only if all sows and boars which have produced a cryptorchid are discarded.

II. K. investigated the occurrence of certain abnormalities—posterior paralysis, scrotal hernia and cryptorchidism—found in piglets on six farms, and

found that the animals which showed these defects were the descendants of certain imported stud boars.

In the case of posterior paralysis the piglets were paralyzed from birth and lay on the right side ; if turned over on the left side they made efforts to get back to their former position. They could freely flex and extend their legs but could not stand without support. Otherwise, they seemed quite normal and in some cases their weight at birth was superior to that of the normal piglets of the litter. Though they could crawl with the aid of their forelegs, still lying on their right side with their hind legs trailing behind them on the ground, their progress was naturally slow and they thus got less milk. Most of them died between the ages of 2 and 4 weeks.

No gross lesions were observed P.M. On histological examination of the nervous system of three affected piglets, degeneration was found in the motor cells of the central nervous system.

The affection was first studied on the Nikonovskoe stud farm in piglets born in the autumn of 1935 from sows mated with the boar " Samson 1809 ". Seven litters with 65 piglets out of 15 with 174 piglets were involved—25 piglets were affected, *i.e.* nearly 15% of the progeny of the boar in 1935.

A scrutiny of the pedigrees of this boar and of the sows served by him showed that 13 of the sows, as well as the boar, were descended from a common ancestor, the boar " Caldwell Jerry, 3178 ". Only seven of these sows, however, produced paralyzed offspring. A son of " Samson 1809 ", " Samson 811 " also produced paralyzed piglets when mated with descendants of " Caldwell Jerry ". After this, male and female descendants of " Caldwell Jerry " were not mated again and no further cases of piglet paralysis were observed on this farm.

The affection was also observed on several other stud farms, and on investigation similar evidence was obtained and is described.

The conclusion is drawn that this type of posterior paralysis was due to a recessive character and was not sex-linked.

In the cases of scrotal hernia, on the evidence of stud-books and the results of the experimental mating of certain boars suspected of being the carriers of this character, scrotal hernia was found to be hereditary, often appearing in the descendants of animals in whose progeny cryptorchidism occurred as well. The actual incidence of scrotal hernia, however, did not conform to the Mendelian formula. In all litters containing piglets with scrotal hernia, there was a marked preponderance of males over females, the reduction in the number of females corresponding to the number of abnormal males. The explanation offered for this is that females homozygous in respect of scrotal hernia perish in the embryonic stage, while the male homozygous carriers of this character survive.

It is stated that similar experiences with cryptorchid pigs confirmed the results obtained by McPhee and Buckley. [See I].

No definite results were obtained regarding the hereditary character of umbilical hernia.

The conclusion is drawn that careful records must be kept of all abnormalities in order to discover the sires which are heterozygous in respect of hereditary defects.—E. Martin.

Schulze, H. G. (1939). Lymphadenose des Colons beim Pferde. **[Lymphadenosis of the Colon in Horses].**—*Z. Veterinärk.* **51.** 378–381. 1 fig. [5 refs.]

A brief review of the literature is followed by a description of the P.M. findings in a lightweight, 30-year-old gelding with lymphadenosis and ulceration of the colon. The peritoneal cavity contained a fibrinous and purulent exudate, the result of

perforation of the ulcer. The regional lymph nodes were enlarged, soft in consistence and greyish-red in colour and, in histological section, showed lymphadenosis. The affected portion of intestine formed a thick tube, extending for about 25 cm. and varying from 1 cm. to 2 cm. in thickness. Histological sections showed infiltration of the whole thickness of the wall with lymphoid cells. Some degree of infiltration was also observed in sections of the liver, spleen, adrenal and thyroid.
—E. G. White.

Purchase, H. S. (1939). **Lymphadenosis in a Native Sangalo Calf.**—*Vet. Rec.* **51.** 955–957. 5 figs., 1 table.

A case of lymphadenosis in a calf is described. With the exception of superficial enlargement of the lymph nodes there were no symptoms of illness. The animal succumbed suddenly when 20 weeks old. Blood examinations at various times showed progressive lymphocytosis. No blood parasites were present. On autopsy the chief macroscopic change was gross enlargement of all l.nn. Microscopically, the l.nn. showed that the normal substance was replaced by a loose reticulo-endothelial tissue. In the liver there was marked degeneration and round-cell infiltration. The kidneys revealed similar infiltration in the cortex. Infiltrations also occurred in the lungs. The spleen was replaced almost entirely by a mass of lymphocytes.

Lymph node material, inoculated into another calf, failed to cause any reaction after ten weeks.—D. D. Ogilvie.

Wagener, K. (1939). Untersuchungen über die Uebertragbarkeit der Geflügellähme. **[Investigation of the Transmissibility of Fowl Paralysis]**.—*Proc. 7th World's Poult. Congr., 1939.* pp. 301–303. Washington, D.C.: U.S. Dep. Agric. [In German]. [Author's English summary copied *verbatim*].

Experimental attempts to induce fowl paralysis in White Leghorns and barnyard fowl by inoculation and by direct contact are described.

The experimental results confirm the transmissibility of fowl paralysis by inoculation and speak for the possibility of transmission by contact.

In the White Leghorns both clinical and anatomic-pathological cases of fowl paralysis as well as latent cases (demonstrable only by histological methods) could be induced by transmission but in the so-called mongrel farm fowl under the same experimental conditions the resulting incidence of fowl paralysis was numerically distinctly lower and only of the latent type.

Next to the transmissible causal agent (of as yet unknown nature), the extent and direction of the disease are determined in decisive degree by constitutional factors.

Johnson, E. P. (1939). **Present Status of Fowl Leukosis (Fowl Paralysis).**—*Proc. 7th World's Poult. Congr., 1939.* pp. 286–288. [4 refs.] Washington, D.C.: U.S. Dep. Agric. [In English]. [Author's summary copied *verbatim*].

Leg paralysis frequently observed in chickens 2 to 15 months of age is usually one of the symptoms of fowl leukosis. Gray eyes resulting in blindness, gasping, paleness, weakness, and emaciation are other symptoms noted in various expressions of the same disease.

Leukosis is primarily a disease of the blood and blood-forming organs. Histopathologically, it occurs in at least three forms, namely, erythro-, lymphoid, and myeloid, depending on which series of cells is stimulated to greatest activity. Considerable overlapping occurs in the three forms, and frequently a change from one form to another takes place during the course of the disease.

The disease is nearly always fatal. The causative agent is filtrable, having many of the characteristics attributable to a filtrable virus. Filtration experiments have shown its size to be between 100 and 400 millimicrons, as contrasted with 1,000 to 1,500 millimicrons, which is the average size of the common paratyphoid organisms that affect chickens.

It may be transmitted from affected birds to well birds by intravenous as well as by subcutaneous inoculations of blood and by other tissue extracts. Moreover, transmission is likewise successful when bacteria-free filtrates from these tissues are used. Transmission may also take place through such agencies as red mites (*Dermanyssus gallinae*) and by the common procedure of vaccination for the prevention of chicken pox.

All the common breeds of fowls appear to be equally susceptible. Certain strains within these breeds, however, appear to be less susceptible than others. Prevention may eventually be possible by developing resistant or naturally immune strains of birds. No drug, feed, mineral nor vitamin, nor combination of these, appears to have curative or preventive value.

BLAKEMORE, F., & DALLING, T. (1939). **Some Recent Observations on Fowl Paralysis (Neurolymphomatosis).**—*Proc. 7th World's Poult. Congr., 1939.* pp. 282–286. 3 tables. [8 refs.] Washington, D.C.: U.S. Dep. Agric. [In English]. [Authors' summary copied *verbatim*].

Recent experiments carried out at the Institute of Animal Pathology, Cambridge, England, with a strain of fowls in which the incidence of fowl paralysis was high showed that by inbreeding and careful isolation of the chicks, the disease entirely disappeared after the second generation. Chicks of the fifth generation were shown to be highly susceptible to fowl paralysis following the injection of tissues from cases of the disease and by exposure to natural infection. Untreated fowls, used as controls, remained healthy. General unthriftiness was marked in the injected and exposed groups, and intestinal parasitic infestation did not occur until late in the course of the infection.

Evidence is produced that fowl paralysis is an infectious disease and that the infecting agent is probably filtrable. A series of passage experiments with liver emulsions in groups of young chicks was carried out, and it was shown that the infecting agent increased in virulence and caused illness and death among the chicks within 1 to 4 weeks. The inoculated stock developed lesions in the viscera, especially the liver and heart. Histologically, the lesions which were inflammatory in character became infiltrated with cells of the lymphoid series. Lesions in the nerves occurred late in the course of the infection and, in one case, a lymphomatous tumor was found.

There is, therefore, evidence that fowl paralysis is a disease which may affect several of the body tissues and that true lymphomatosis represents a final stage of the disease in which various tissues, including the nerves, may be involved and actual lymphomatous tumor formation may occur. Previous failures to transmit the disease may be due to the susceptibility of the strain of fowls employed, the degree of virulence of the infecting agent, the stage of the disease at which tissues are selected for transmission work, and the type of tissue selected.

DURANT, A. J., & MCDOUGLE, H. C. (1939). **Studies on the Origin and Transmission of Fowl Paralysis (Neurolymphomatosis) by Blood Inoculation.**—*Res. Bull. Mo. agric. Exp. Sta.* No. 304. pp. 23. 11 figs., 2 tables. [Numerous refs.]

Owing to the differing opinions which are held as to the relationship of fowl paralysis (neurolymphomatosis) and the erythro- and myeloid leucaemias of fowls,

the authors have assumed that neurolymphomatosis is a distinct entity caused by a filtrable virus which brings about changes in the nervous system, the eye, and possibly tumour formation in other organs such as the ovary.

White Leghorn hens showing the eye form of fowl paralysis were mated with healthy White Leghorn cocks. The chicks obtained from these matings were used when two days old as blood donors to chicks of the same age from a flock in which there was no history of fowl paralysis. The former, comprising a total of 22 chicks, continued to be used as donors until they reached the age of 136 days. The technique of the blood inoculations, which were made every 10 days, is briefly outlined.

527 chicks became recipients and 507 chicks served as controls. Of the 527 inoculated chicks, 91 developed fowl paralysis, *i.e.* 17·1 %, and of the 507 controls, 18 developed the disease, *i.e.* 3·55 %. The authors believe that there were three periods during the course of the experiment when the blood most readily transmitted the disease. No blood changes were noted in the fowl paralysis cases. The number of cases of leucosis and tumour formation was relatively small and about equal in the control and inoculated groups.—L. E. Hughes.

Jármai, K. (1939). Ueber die Röntgenresistenz des Agens der übertragbaren Hühnerleukose im Vergleiche zu einigen übertragbaren Tiergeschwülsten und zu den Agenzien der übertragbaren Hühnersarkome. [**X-Ray Resistance of the Causal Agents of Fowl Leucosis, Fowl Sarcoma and other Transmissible Tumours**].—*Arch. wiss. prakt. Tierheilk.* **74.** 67–74. [9 refs.]

The resistance to X-rays of certain animal tumours was investigated in order to determine whether there is any difference between cellular and filtrable agents. An identical technique was used for the following tumours :– Ehrlich's mouse carcinoma, Morawek-Jedlickas' mouse carcinoma, Alapy's pyrobenzene sarcoma, Viniss' methylcholanthrene sarcoma, Flexner-Jobling's rat sarcoma, Rous' fowl sarcoma and the causal agent of erythroleucosis. The tumour material was obtained from the freshly-killed animal, emulsified in saline and sealed in glass tubes. The action of 20 HED [" Hauteinheitsdosen "—one HED = 550r.] destroyed both of the first-named carcinomata, the rat sarcoma and the chemically-caused tumours. Rous sarcoma survived 166 HED and the erythroleucosis tissue survived 240 HED. As there was so much difference in resistance between the cellular tumours and the fowl sarcoma and erythroleucosis agents, J. suggests that the two latter are caused by some agent other than a living one.

—Sassenhoff (Munich).

Szundy, L. (1938). Adatok a szarvasmarha szemdaganataihoz. [**Data on Tumours of the Eye in Cattle**].—*Thesis, Budapest.* pp. 15. [Numerous refs.] [German summary].

Eight eye tumours were examined and all were found to be carcinomas, originating in the lids and conjunctiva. There were no changes in the eyeballs other than those mechanically induced by the presence of the tumours.—E. Martin.

NUTRITION IN RELATION TO DISEASE

Metzger, H. J., & Morrison, H. B. (1936). **The Occurrence of Milk Fever in the Kentucky Station Herd Over a Period of Twenty Years.**—*Proc. 29th ann. Meet. Amer. Soc. Anim. Prod. 1936.* pp. 48–52. 3 tables. [3 refs.]

During the period 1916–1935 inclusive, records were kept of a herd of 218 cows of breeding age consisting of 148 Jerseys, 49 Holsteins, 17 Guernseys and

4 cross breds. The summarized data show :– that no cases of milk fever occurred in heifers with the first calf, some of the cows became susceptible with the second calf, and this susceptibility apparently increased up to the fifth or sixth calf ; the Jerseys showed a greater tendency to the disorder than the other breeds, and the maximum number of cases occurred during the winter and early spring months.
—R. ALLCROFT.

PHILP, R. C. T., DUMAPESO, J. A., & WILSON, R. J. (1939). **"Coasty Disease" Trials, King Island, 1938–39.**—*Tasm. J. Agric.* **10.** 105–109. 1 fig., 1 table. [4 refs.]

Preliminary experiments in which a cobalt sulphate-copper sulphate drench was administered twice weekly to sheep have demonstrated that "coastiness" of King Island is associated with a deficiency either of cobalt or of copper and cobalt. In view of the geological and geographical relationship of King Island to the "coasty" areas of South Australia, it seems that both cobalt and copper may be lacking in sufficient quantities.—M. C. FRANKLIN.

ELLIS, N. R., & MADSEN, L. L. (1939). **Relation of Diet to a Type of Leg Weakness in Swine Induced by Nerve Degeneration.**—*Proc. 32nd ann. Meet. Amer. Soc. Anim. Prod. 1939.* pp. 393–394.

In continuation of previous studies [see *V. B.* **8.** 241.], the authors report in abstract form that they have completed their studies on the relationship of diet to lameness and locomotor incoordination in pigs. Although complete protection has not been achieved, it is stated that the disease can be produced at will by feeding a heat-treated diet supplemented by cod liver oil. Myelin degeneration is a feature of the nerves and spinal cords of affected animals. It is not considered that genetic factors or infection play any primary part in the causation of the condition, which does not respond readily to curative treatment. Supplements such as liver, whey and rice-bean exert a protective action, hence some factor of the vitamin B complex may be involved.—ALASTAIR N. WORDEN.

MAREK, J., WELLMANN, O., & UREÁNYI, L. (1938). I. Folytatólagos tanulmány az angolkórról és a csontlágyulásról. II. További vizsgálatok az angolkórról és a csontlágyulásról. [**Research on Rickets and Osteomalacia. I & II**]. —*Állatorv. Lapok.* **61.** 1–5 and 75–79. 4 figs., 5 tables. [13 refs.]

Abstracts from German translations of these articles have already appeared [*V. B.* **10.** 198].

NIELSEN, H. M., & MADSEN, D. E. (1940). **The Difference in Serum Calcium and Inorganic Phosphorus Content of Normal Turkeys Affected with a Bone Deformity.**—*Poult. Sci.* **19.** 198–200. 1 table. [2 refs.]

A bone deformity of partially grown turkeys which is often termed "spraddle-leg" and which is similar to perosis is described. Estimation of the serum Ca and P from 32 affected birds and 188 normal birds at approximately 28 weeks of age, indicated that the serum Ca of the affected birds was slightly lower than that of the normals, while the serum P was slightly higher.—R. ALLCROFT.

PORTER, J. R., & RETTGER, L. F. (1940). **Influence of Diet on the Distribution of Bacteria in the Stomach, Small Intestine and Cecum of the White Rat.**—*J. infect. Dis.* **66.** 104–110. 2 figs., 1 table. [Numerous refs.]

Bacteriological data obtained from feeding different diets to 12 groups of rats, each consisting of ten animals, are presented and discussed. The evidence shows that on a stock diet the "normal" bacterial flora of the young white rat was found

to be comparatively simple, especially in the upper segments of the alimentary tract, the flora being made up largely of the *Lactobacillus acidophilus* type of aciduric organisms. Bacteria became increasingly more abundant in the lower sections of the small intestine, the lower ileum and caecum containing appreciable numbers of coliform organisms, and comparatively few sporulating anaerobes. Other types such as cocci and yeast-like fungi were often present in all segments but were usually numerically insignificant. The results show that the so-called normal bacterial flora can be altered throughout the digestive tract by certain foods or by starvation, but that it is fairly stable irrespective of the diet. The present investigation gives no evidence of a definite relationship between the hydrogen-ion concentration of the intestinal contents of rats and the character of the bacterial flora in the stomach and upper small intestine, but in a few instances in the lower ileum and caecum there appeared to be some correlation.—R. ALLCROFT.

PETERSON, W. J., & HUGHES, J. S. (1939). **Nutritional Diseases of Poultry.**—*Vet. Med.* **34.** 731–733. 2 figs., 1 table.

This is a short article with an extensive table indicating the necessary ingredients in a poultry ration to ensure freedom from nutritional deficiency.

The headings in the table include the following :– (1) substances essential for an adequate diet, and (2) sources of these substances, amounts required and the effects of their deficiency.—L. E. HUGHES.

BEARSE, G. E., MILLER, V. L., & MCCLARY, C. F. (1940). **The Cannibalism Preventing Properties of the Fiber Fraction of Oat Hulls.**—*Poult. Sci.* **19.** 210–215. 6 tables. [3 refs.]

The results of feeding trials involving duplicate groups of 64 White Leghorn pullets each, from 2–40 weeks of age, showed that cannibalism was controlled, and the quality of the feathers improved, when oat hull fibre, obtained by dilute acid digestion of oat hulls, was fed at a level sufficient to produce a ration of 11 % fibre. Oat hulls were equally effective, but both the ash prepared from a dilute acid extract, and a water extract of the hulls had little effect in preventing cannibalism. —R. ALLCROFT.

WHITNAH, C. H., PETERSON, W. J., ATKESON, F. W., & CAVE, H. W. (1939). **Carotene Balance and Blood-Carotene Levels in Heifers and Lactating Dairy Cows and Their Relation to the Production of Off-Flavour Milk.**——*J. agric. Res.* **58.** 343–355. 2 tables. [Numerous refs.]

The carotene content of the ration, faeces and blood, and the flavour of the milk, were investigated in heifers and lactating cows, which were fed various rations for periods of a few weeks to a few months, with and without carotene supplements. The daily intake ranged from 0·003–2·51 mg. per kg. body weight. The amount in the faeces was 75–1,470 % of the intake. The ratio, output to intake, of carotene was greater at the lower intake level. There was considerable individual variation, and feeding histories for several months previously sometimes had to be taken into account. The blood serum contained 0·027–1·42 mg. per 100 ml., varying greatly from one animal to another and with the intake. Intakes below 0·075 mg. per kg. body weight were associated with a highly oxidized flavour of the milk, and more than 130 % of the carotene in the ration was excreted in the faeces. With intakes of over 0·3 mg. per kg., the milk was of good flavour, and less than 100 % of the carotene in the ration was excreted in the faeces. Intermediate values had no regular association.

The optimum carotene intake appears to be much greater than the minimum required to prevent recognizable deficiency, as shown by the frequent finding of

a negative carotene balance, carotene blood levels below those of animals on pasture, and the fact that off-flavour milk can be prevented by feeding increased carotene.—E. I. McDougall.

Snell, E. E., Pennington, D., & Williams, R. J. (1940). **The Effect of Diet on the Pantothenic Acid Content of Chick Tissues.**—*J. biol. Chem.* **133.** 559–565. 4 tables. [Numerous refs.]

The tissues of chicks reared on the heated (pantothenic acid deficient) diet of Jukes for 19–26 days were assayed by the yeast test method of Williams and by a modification of the bacterial test of Snell (using *Lactobacillus casei* ϵ). It was found that the tissues assayed, *viz.*, liver, kidney, leg muscle, blood, brain and spinal cord, contained only 30–70% as much pantothenic acid per g. as corresponding tissues from chicks fed a diet sufficient in pantothenic acid. Since the deficient chicks were much smaller than normal, the absolute pantothenic acid content of entire tissues of the deficient chicks was only 10–40% that of the normal tissues.—R. Allcroft.

Frost, D. V., & Elvehjem, C. A. (1939). **Factor W and Its Relation to the Vitamin B Complex.**—*J. biol. Chem.* **128.** 23–34. 1 fig., 1 table. [16 refs.]

Evidence is presented to show that factor W is not vitamin B_6, nicotinamide, nicotinic acid, the chick antidermatitis factor or riboflavin. Results are given which show that the response of rats to nicotinic acid and its amide is dependent upon the composition of the ration.—R. Allcroft.

Pappenheimer, Alwin M., Goettsch, Marianne, & Karsubova, Claudia. (1940). **Effect of Nerve Section upon Development of Nutritional Muscular Dystrophy in Young Rats.**—*Proc. Soc. exp. Biol., N.Y.* **43.** 313–316. 3 figs., 1 table. [7 refs.]

Muscular dystrophy was produced in young rats according to the technique described by Goettsch and Ritzmann [*V. B.* **10.** 700]. Section of the left sciatic nerve through an incision on the posterior surface of the thigh was performed under ether anaesthesia on 42 rats from the 5th–8th day during the lactation period. The animals were killed soon after the development of symptoms or upon the 24th day if none occurred. The results of histological examination of right and left gastrocnemius muscles showed that on the right side, where the nerve supply was intact, the usual severe lesions occurred, *viz*, hyaline necrosis and segmentation of fibres, interstitial oedema, polymorphonuclear and histiocytic reaction, activation and proliferation of myoblasts. In sharp contrast to these necrotizing and inflammatory lesions, the left gastrocnemius which had been deprived of its nerve supply, showed only the usual alterations consequent upon nerve section. It is concluded that removal of nerve impulses protects the muscles of young rats from the usual effects of vitamin E deficiency.—R. Allcroft.

Mason, K. E., & Bryan, W. L. (1938). **Standardization of the Rat for Bio-Assay of Vitamin E.**—*Biochem. J.* **32.** 1785–1791. 3 tables. [16 refs.]

The observations reported suggest that the variable responses of young rats of both sexes to deprivation of vitamin E can be closely correlated with the vitamin E content of the maternal diet to which the unweaned young have access when they begin to eat. Substitution of a vitamin E deficient diet for the maternal diet during the last half of lactation resulted in very low initial storage of the vitamin in newly weaned offspring. Preliminary experiments with both males and females indicated that placental and mammary transfer of vitamin E from mother to young was very small even when the maternal intake was very high.—R. Allcroft.

KNOWLTON, G. C., HINES, H. M., & BRINKHOUS, K. M. (1939). **Cure and Prevention of Vitamin E-Deficient Muscular Dystrophy with Synthetic α-Tocopherol Acetate.**—*Proc. Soc. exp. Biol., N.Y.* **42.** 804–809. 3 figs., 3 tables. [8 refs.]

An established muscular dystrophy in male rats, maintained on a vitamin E deficient diet, was completely cured by the weekly subcutaneous injection of 3 mg. of α-tocopherol acetate in 0·1 c.c. olive oil. The injections were started at the age of five months and continued until the animals reached the age of eight months when the muscles were examined histologically. In experiments testing the preventive effects of α-tocopherol, the weekly supplements were started at one month of age and continued until 5 months of age. From the data it appears that α-tocopherol acetate in the dosage used was more effective in promoting a cure in the older animals than in preventing symptoms in the younger animals.—R. A.

BACHARACH, A. L. (1938). **Investigations into the Method of Estimating Vitamin E. III. The Relation between Dosage and Response to Vitamin E.** —*Biochem. J.* **32.** 2017–2023. 1 fig., 4 tables. [5 refs.]

Investigations on rats are described from which a dosage-response curve was constructed for vitamin E. The relation between total dosage of wheat-germ oil concentrate and fertility rate is given.—R. ALLCROFT.

I. ANON. (1939). **Recent Progress with Vitamin K.**—*Brit. med. J.* Dec. 23rd. 1232–1233. [12 refs.]

II. ANON. (1939). **Vitamin K.**—*Lancet.* **237.** 1178–1179. [17 refs.]

I. A brief summary is given of recent advances in the therapeutic application of vitamin K and the conditions in which its use may be indicated.

II. A short description is given of the history of vitamin K. Its discovery, isolation, identification, synthesis, and chemical applications are discussed.—R. A.

MACFIE, J. M., BACHARACH, A. L., & CHANCE, M. R. A. (1939). **The Vitamin K Activity of 2-Methyl-1 : 4-Naphthoquinone and its Clinical Use in Obstructive Jaundice.**—*Brit. med. J.* Dec. 23rd. 1220–1223. 5 figs., 1 table. [Numerous refs.]

A description is given of certain points of technique which constitute minor modifications in the methods of biological test for vitamin K activity.

The results of an assay on young chicks of a sample of methyl-naphthoquinone indicated that the determination of crude blood-clotting times offers a better means of biological assay than determination of prothrombin times.

It is suggested that 2-methyl-1 : 4-naphthoquinone could be used as a synthetic substitute for natural vitamin K. The case reports indicated that this synthetic product is effective in raising the prothrombin index in cases of obstructive jaundice, and its value in the prevention and treatment of haemorrhage in jaundice is apparent.—R. ALLCROFT.

PUBLIC HEALTH

FRIESEN, A. (1937). Beitrag zum Nachweis der Bang-Bakterien in der Milch. [**Demonstration of** *Br. abortus* **in Milk**].—*Inaug. Diss., Berlin.* pp. 46. 2 tables. [Numerous refs.]

F. compared the richness of brucella organisms in centrifuged milk sediment and gravity cream and found that gravity cream contained most organisms. He

speaks of the comparative value of agglutination tests on skim milk and whey for brucella infection.—M. F. Benjamin.

Bryan, C. S. (1939). **The Relation of Streptococcic Mastitis to Certain Phases of Milk Sanitation.**—*J. Milk Technol.* **2.** 32–40. 6 figs., 6 tables.

This is a general article containing no new information. The importance of clinical inspection of the udder and of microscopic examination of the milk is stressed. It is stated that the latter gives 99% positive results in infected cows, whereas the blood-agar plate method gives only 90% positive results. [This statement is obviously untrue.]—John Francis.

Elkington, G. W., Wilson, G. S., Taylor, Joan, & Fulton, F. (1940). **A Mild Epidemic of Undulant Fever in a Boys' School due to Drinking Raw Milk.**—*Brit. med. J.* March 23rd. 477–478. 1 table. [5 refs.]

Each of the boys in the school had received a glass of raw milk daily. Two definite cases of undulant fever developed and 26 of the boys had transient illness. Ten of the boys had serum agglutinins for *Brucella abortus* of 1 : 20 to 1 : 1,100. Of 17 with no symptoms of undulant fever five had agglutinins of 1 : 20 to 1 : 1,000.

Examination of the milk supply revealed the presence of *Br. abortus*.—F. T. B.

Jepsen, A., & Christiansen, M. J. (1940). Orienterende undersøgelser over forekomsten af tuberkelbakterier i afløbsvand fra slagterier og mejerier. [**The Occurrence of Tubercle Bacilli in Waste Water from Abattoirs and Dairies**].—*Beretn. 5. nord. Vet.-møde, Kbh., 1939.* pp. 97–115. 4 tables. [3 refs.] [German summary].

As there appear to be no published records of the presence or absence of live tubercle bacilli in the waste water of abattoirs or dairies, or of the potential danger to animals having access to such waters, the authors examined 5-litre samples of waste water from six pig abattoirs, one general abattoir and seven dairy depots in Denmark. The drainage systems are fully described as well as the technique of obtaining and treating the samples of water, which were filtered, the solid matter from the filters being used for the preparation of an inoculum for intraperitoneal use on 8–10 g. pigs per sample. G. pigs which became infected were killed after three months and cultures were prepared from the lesions and type-differentiated on Löwenstein's and Besredka's media. The waste waters of three of the pig abattoirs and that of the general abattoir were proved to contain tubercle bacilli. The bacilli from the first abattoir were of the bovine type and those from the second of the human type; both bovine and avian types were present in the third, and bovine type bacilli in the waste water from the general abattoir. All tests with dairy waste water were negative.—J. E.

Collins, F. V. (1939). **Miscellaneous Notes and Queries On Meat Inspection in South Australia.**—*Aust. vet. J.* **15.** 94–103. [6 refs.]

Tuberculosis in cattle has a low incidence, necessitating total condemnation in only 0·2–0·4% of carcasses. In pigs, lesions diagnosed macroscopically as tuberculosis are much more common in young animals than in adults.

Cysticercus ovis cysts are found in approximately 0·25% of lambs, but are rarely seen in adult animals. Very careful inspection is conducted in connexion with this parasite. It is of economic importance, as infected carcasses are rejected for export. *Cysticercus tenuicollis* is very common in lambs and less common in pigs, and occasionally extremely heavy infections are found. Damage to the liver,

caused by the burrowing of the pre-scolex stage of this parasite, leads to condemnation of about a third of ovine livers; this means considerable economic loss. *Echinococcus granulosus* is commonly found in sheep and cattle and sometimes in pigs. In pigs, chronic interstitial hepatitis, presumably caused by *Ascaris lumbricoides* larvae, is very common.

Penetration of grass seeds in carcasses of mutton, particularly lamb, is a serious cause of loss to the industry. Hundreds of seeds may pierce the skin and set up a severe inflammatory reaction in the subcutaneous tissue, and great loss of condition. The body wall is often penetrated and seeds may be found almost anywhere, one even having been found in the brain. Cutaneous myiasis causes a subcutaneous reaction, and in severe cases the whole carcass requires condemnation. Arthritis was present in 0·13% of lamb carcasses in 1937. A diamond-shaped urticaria is occasionally seen in pigs, possibly due to swine erysipelas, although this disease has not yet been diagnosed in South Australia. During certain times of the year the weed *Oxalis cernua* is prevalent in some areas and causes severe kidney lesions in lambs. Symmetrical muscular degeneration is sometimes seen in lambs. Such muscles, usually the serratus ventralis and the vastus group, show a peculiar striation of a white, creamy or light brown colour. Large numbers of apparently normal sheep killed in South Australia have black livers, the exact nature or cause of which has not been determined. Another pigmentation of unknown origin is yellow colouring of the fat in some lambs, unassociated with icterus. No cases of meat poisoning in South Australia have been traced to *antemortem* infection of meat.—W. I. B. Beveridge.

Roos, J. (1938). **Stunning of Slaughter Animals by Methods applied in Recent Times.**—*Rep. 13th int. vet. Congr. 1938.* **2.** 1167–1181. [In English: French, German and Italian summaries. Discussion pp. 1181–1186 in French and German].

A critical analysis is given of the work of the chief authorities on the use of electricity as a means of "stunning" animals prior to slaughter. A survey is given of the use of electricity of varying currents for varying periods, including its intentional and accidental application to animals and man. The evidence both for and against the assumption that true unconsciousness is evoked by the use of electricity is sifted and assessed and it is stated that the effect of electricity on animals is that of excitation of cerebrospinal and autonomic nerve centres to the extent of producing immobility of muscles and organs of expression, rather than the induction of true loss of consciousness. The case for the use of electricity as a means of true stunning is found "not proven" and a plea is made for the recognition of this fact. Support is given to the use of more positive methods of producing loss of consciousness in animals prior to slaughter—mechanical stunning, etc.—H. Burrow.

Paranjothy, J. T. (1939). **Rat Virus Enquiry Report including a Note on the Raticidal Value of Certain Commercial and Other Chemical Poisons.**—*Bull. Inst. med. Res., F.M.S.* No. 1. pp. 23. 10 tables.

The object of the experiments reported in this bulletin was to assess the value of certain bacterial and chemical preparations for the control and extermination of rats. Rats infected with various rat "viruses" were placed with normal rats in enclosed pens, in which favourable conditions existed for the spread of infection. The "viruses" used were:– *Salmonella enteritidis* "Medan" (a Sumatra local strain); *S. enteritidis* "Liverpool", obtained from commercial "Liverpool Virus"; *S. enteritidis* "Ratin", obtained from "Ratin", a commercial preparation; and

three organisms of the Pasteurella group—*Past. muriseptica*, *Past. cuniculiseptica* and *Past. aviseptica*. It was found that *S. enteritidis* " Medan " inoculated intraperitoneally, and the same organism along with *S. enteritidis* " New Liverpool Virus " given in the food (milk), were effective in killing rats. Uninfected rats, however, with few exceptions, failed to become infected after contact with infected rats. It was concluded, therefore, that there is little possibility of the intentional precipitation of widespread epidemics among local rats by the use of rat " viruses ". Experiments undertaken to enhance the virulence of the *S. enteritidis* strains and *Past. muriseptica* were inconclusive. Commercial preparations of " Liverpool Virus " and " New Liverpool Virus ", received from Europe by ocean or air mail, were found to be innocuous for rats in Malaya.

Inoculation experiments with ectromelia virus established the fact that this virus, though definitely pathogenic for local mice, was non-pathogenic for local rats.

Details are given regarding the efficacy of certain chemical raticides.

One section of the report is devoted to biological data on the following local species of rats :– *Rattus rattus diardi*, *R. r. jalorensis* and *R. r. conedor*. These data refer to the bacterial and protozoan forms isolated at P.M. examination from control and free-living rats.—N. J. Scorgie.

THERAPEUTICS

I. Cruickshank, J. C. (1939). **Chemotherapy of Experimental Anthrax Infection [Sulphanilamide].**—*Lancet*. **237.** 681–684. 7 figs., 5 tables. [14 refs.]

II. May, H. B., & Buck, S. C. (1939). **Action of the Sulphonamides in Experimental Anthrax.**—*Ibid.* 685–686. 3 tables. [9 refs.]

III. Anon. (1939). **Chemotherapy in Anthrax. [Sulphanilamide].**—*Ibid.* 750. [6 refs.]

I. Results are recorded of experiments carried out to determine whether sulphanilamide or M & B 693 had any effect on the course of anthrax infection in mice.

A total of 150 mice were infected with *Bacillus anthracis* subcutaneously and divided into five groups, one of which was kept as a control. Those of groups other than the control received throughout the experiment daily doses of either 10 mg. of sulphanilamide *per os*, 10 mg. of sulphanilamide subcutaneously, 10 mg. of M & B 693 *per os* or 10 mg. of M & B 693 subcutaneously. None of the mice survived beyond the fourth day after infection, but both drugs had some effect in delaying death from anthrax infection, there being no difference in the effects of oral or subcutaneous administration. Of the two M & B 693 was the more effective.

II. M & B 693 and to a less extent, sulphanilamide and sulphone delayed death in mice infected with fully virulent, capsulated, non-sporing anthrax bacilli, but there was no ultimate decrease in mortality.

III. This merely comments on the findings of I and II.—F. T. Boyle.

Woods, D. D. (1940). **The Relation of *p*-Aminobenzoic Acid to the Mechanism of the Action of Sulphanilamide.**—*Brit. J. exp. Path.* **21.** 74–90. 9 tables. [15 refs.] [Author's summary copied *verbatim*].

(1) Yeast extracts contain a substance which reverses the inhibitory action of sulphanilamide on the growth of haemolytic streptococci.

(2) Examination of the chemical properties of this substance and its behaviour in growth tests suggested that it might be chemically related to sulphanilamide.

(3) *p*-aminobenzoic acid has a high activity in antagonizing sulphanilamide inhibition.

(4) There is strong circumstantial evidence that the yeast factor may be *p*-aminobenzoic acid.

(5) On the basis of these results a suggestion is put forward regarding the possible mode of action of sulphanilamide.

Bazeley, P. L., Jakobowicz, Rachel, & Splatt, Beryl. (1939). **Dose Rates and Blood Concentrations of Sulphanilamide in Horses.**—*Aust. vet. J.* **15.** 199–205. 5 figs., 1 table. [1 ref.]

Horses of various weights were given sulphanilamide by stomach tube and the concentration of the drug in the blood was determined at frequent intervals. The results are illustrated in graphs.

The blood-concentration curves were very uniform in different horses given equivalent body-weight doses. If it is desired to maintain a certain minimum blood concentration, a single daily dose is as efficient as two half doses at 12-hour intervals. If the same dose is administered daily for several days there is a rise in the maximum and minimum blood concentrations on successive days, owing to a cumulative effect. It is, therefore, suggested that a relatively large initial dose be given and that subsequent daily doses need be only about two-thirds of that amount. To minimize any slight risk of toxic effects from the relatively large initial dose, it is suggested that this be given in two parts with an interval of about 8 hours. The authors did not, however, encounter any obvious toxic effects of the drug when administered in amounts yielding up to 10 mg. per 100 ml. of blood. Subcutaneous administration was not satisfactory. The table shows the daily doses suggested for maintaining certain concentrations of sulphanilamide in the blood.

Weight of Horse		*Desired Concentrations (approx.) in mg. per 100 ml. Blood*			
		2 mg. per 100 ml.	3 mg. per 100 ml.	4 mg. per 100 ml.	5 mg. per 100 ml.
		g.	g.	g.	g.
750 lbs.	1st day	35	45	56	67
	2nd day onwards	25	30	37	45
1,000 lbs.	1st day	48	60	75	90
	2nd day onwards	32	40	50	60
1,250 lbs.	1st day	57	75	93	110
	2nd day onwards	38	50	62	75
1,500 lbs.	1st day	67	90	110	135
	2nd day onwards	45	60	75	90

—W. I. B. Beveridge.

van WINKLE, W., Jr., & CUTTING, W. C. (1940). **Acetylation of Sulfanilamide and Sulfapyridine in the Cat.**—*J. Pharmacol.* **69.** 40–44. 1 table. [8 refs.] [Authors' summary copied *verbatim*].

1. Sulfanilamide is readily acetylated in the intact cat, the isolated perfused cat liver, and the hepatectomized cat, but not in the hepatosplenectomized or eviscerated cat, indicating that the liver and spleen are the sites of the acetylation process.

2. Sulfapyridine is acetylated in the intact cat and variably in the hepatectomized cat, but not in the isolated perfused liver, nor in the eviscerated animal; in the intact cat the liver and probably the spleen are the sites of the acetylation process.

3. The hepatectomized rabbit does not acetylate sulfanilamide.

4. Of the 2 acetyl derivatives, only acetylsulfapyridine is broken down by the cat, and this takes place only in the liver, indicating that the same enzyme systems are not involved in acetylation as in deacetylation.

5. Sulfanilamide and sulfapyridine are conjugated to about the same degree in the cat, thus differing from several other species in which one mechanism is preponderant.

DUBOIS, A., & KOHN, I. (1940). A propos du mécanisme d'action du Bayer 205 sur les trypanosomes. [**Mechanism of Action of Bayer 205 on Trypanosomes**].—*Ann. Soc. belge Méd. trop.* **20.** 51–56. [4 refs.] [Dutch summary].

The authors, conducting experiments on the action of Bayer 205 on trypanosome, were unable to confirm the finding of JANCSO and JANCSO [*V. B.* **8.** 467.] that the reticulo-endothelial system comes into action to assist the trypanocidal property of germanin. When blood was taken from trypanosome-infected mice 12–14 hours after treatment with germanin and the trypanosomes were removed and washed by centrifuging and injected into other mice, living organisms could be found in the blood of the latter for 24 hours. After 24 hours no further trypanosome infection could be detected. Blockading the reticulo-endothelial system with colloidal copper did not prevent the disappearance of trypanosomes.—U. F. R.

ROTHERMUNDT, M., & BURSCHKIES, K. (1939). Ueber neue Erfahrungen auf dem Gebiete der aromatischen Arsenverbindungen. [**New Experiences Concerning the Activity of Aromatic Arsenical Compounds**].—*Zbl. Bakt. I.* (*Orig.*). **144.** 235*–238*. [3 refs.]

It is pointed out that the value of a drug in treatment depends largely on its specific action on the parasite concerned and that organic compounds of arsenious acid with the composition 4-amino-2-oxyphenyl . . . are more effective against trypanosomes, whilst those with the composition 3-amino-4-oxyphenyl . . . are more effective in syphilis. The value of a drug is also largely governed by the therapeutic index (curative dose/tolerated dose). Toxicity tests were made of organic arsenic substances produced by introducing different acid esters into the amino groups. It was found that whilst a 20 g. mouse could support only 30 mg. of 3-amino-4-oxyphenyl arsenious acid, the dose could be increased to 120 mg. with the acetyl compound and 180 mg. with the isobutyryl compound, but had to be decreased again with the isovaleryl and valeryl compounds. With the less toxic compounds the mice developed neurotoxic symptoms, which are explained as being due to the increased amount of arsenic which could be administered. The variation in the therapeutic index of the drugs of this series was considered to depend on the size of the molecule.—U. F. RICHARDSON.

I. Dubois, A., & Kohn, I. (1939). A propos du mode d'action de l'arsénobenzène sur les trypanosomes. [**The Action of Arsenobenzene on Trypanosomes**].—*Ann. Soc. belge Méd. trop.* **19.** 501–508. 3 tables.

II. Dubois, A., & Losner, S. (1939). L'élimination de l'arsénobenzène chez les animaux normaux et à système réticulo-endothélial bloqué. [**Elimination of Arsenobenzene by Normal Animals and those with the Reticulo-Endothelial System Blockaded**].—*Ibid.* 513–525. 1 chart. [6 refs.]

I. By treating mice infected with *Tryp. brucei* with "novarsenobillon" ("914") [neosalvarsan] and inoculating blood drawn from them into other mice within a few minutes of treatment, it was shown that the action of the drug is so rapid that it must act directly on the trypanosomes without the defence mechanism of the host being involved. This experiment throws doubt on the claim that washing trypanosomes treated with "914" would remove the drug and allow them to regain their infectivity. A small number of experiments was undertaken in which blood was taken from infected mice shortly after treatment and the trypanosomes washed in saline and then injected into fresh mice. These organisms also failed to produce infection.

It is claimed that "914" must be oxidized in solutions before it will exert its maximum trypanocidal action, and that, inoculated subcutaneously, it is more toxic and more rapid in action than when inoculated intravenously. This was not confirmed by experiment, and, in fact, the drug inoculated intravenously acted rather more rapidly. Reducing agents, particularly methylene blue, did retard the action of the drug.

II. In the second paper an attempt is recorded to determine the quantities of arsenic in the blood of normal and blockaded animals at various intervals after the injection of "914", in view of the claim that blockade, by reducing the tissue fixation of arsenic, favours a higher blood concentration. Little difference could be demonstrated between normal and blockaded animals, either in respect of the concentration of arsenic in the blood or in the spleen, but it was demonstrated that the concentration of arsenic in the blood remained sufficiently high for at least 24 hours to explain the trypanocidal action of the drug.—U. F. Richardson.

Friedheim, E. A. H. (1938). Ueber die Beziehungen zwischen chemischer Konstitution, trypanozider und neurotoxischer Wirkung aromatischer Arsinsäuren. [**Relations between the Chemical Constitution and the Trypanocidal and Neurotoxic Actions of Aromatic Arsinic Acids**].—*Schweiz. med. Wschr.* **68.** 826–828. 1 table. [1 refs.]

The cytotoxic properties by which aromatic arsinic acids exert their trypanocidal activity also affect the body cells of the host, and the commonest site of damage is the central nervous system. It has been suggested that the neurotoxic effect is due to solubility in fat, and it has also been shown that the introduction of a sulphur group leads to the production of active trypanocidal substances which are not fat soluble and even in high doses are not neurotoxic. In order to obtain further evidence on this point a series on organic arsinic acids was studied in relation to trypanocidal and neurotoxic activity. It was found that neither *p*-phenyl-hydrazine arsinic acid nor any of its derivatives were neurotoxic, but the acyl derivatives were trypanocidal. The low toxicity of phenyl-hydrazine arsinic acids appears surprising when compared with the extraordinary toxicity of phenyl-hydrazines. A comparison of the powerfully trypanocidal and neurotoxic arsacetin with the slightly trypanocidal and non-neurotoxic acetyl-phenyl-hydrazine arsinic acid suggests that the introduction of an imino group into the side chain causes loss of toxicity. It is suggested that this is connected with the electro-negative, salt-forming peculiarities of the imino groups which reduce solubility.—U. F. R.

LEVINE, P. P. (1939). **The Effect of Sulfapyridine on Experimental Avian Coccidiosis.**—*J. Parasit.* **25.** Suppl. p. 35. [Copied *verbatim*].

Sulfapyridine, when fed to chickens in the proportion of 0·7% of the mash, had a marked coccidiostatic effect on *E. praecox*, *E. mitis* and *E. hagani*. The total number of oöcysts discharged by the control birds during the first 8 days of the experiments was 70, 89, and 11 times greater, respectively, than that of the treated birds. When, after this time, the sulfapyridine was withdrawn, the number of oöcysts discharged increased and reached a peak 5 days later. In no case was this peak as high as that of the controls. Sulfapyridine had no effect on the course of the infections with *E. tenella* or *E. necatrix*. The effect of sulfapyridine on avian coccidia was quite similar to that of sulfanilamide [LEVINE (*V. B.* **10.** 126)]. The former compound was non-toxic for the birds while the latter was definitely toxic.

KÜHBACHER, H. (1939). Die Behandlung der Stuttgarterseuche mit Leptosprit. **[Treatment of Stuttgart Disease with "Leptosprit"].**—*Wien. tierärztl. Mschr.* **26.** 433–439. [Numerous refs.]

Stuttgart disease is so prevalent in Vienna that at times it is responsible for half the attendances at veterinary clinics. The most prevalent form, characterized by disease of the kidney, is due to *Leptospira canicola*. Epizootics commence in September and decline in December and January, and in some outbreaks the mortality may reach 81%. "Spirosit", neosalvarsan, acriflavine and antileptospiral sera have proved ineffective in treatment, but the intravenous injection of 4% formaldehyde has been fairly successful. It is interesting that this drug appears to stimulate the defence mechanism and does not act directly on the leptospira, treated animals excreting enormous numbers of leptospira in the urine. During the last five years "leptosprit", a compound of higher fatty acids containing glycerin, phosphoric acid and cholesterin has been used with such good results that mortality has been reduced to 18%. The drug is administered in doses of 0·5–1 c.c., divided and injected intradermally in two or three places. Treatment is repeated 4–7 times.

Attention is drawn to the great variation in the symptoms of the disease, K. relying for diagnosis on examination of centrifuged urine by dark-ground illumination.—U. F. RICHARDSON.

PIERPONT, R. L. (1939). **Terpene Ethers in Pyrethrum and Rotenone Fly Sprays.**—*Bull. Del. agric. Exp. Sta.* No. 217. pp. 59. 15 figs., 2 plates, 36 tables. [7 refs.]

Of various synthetic terpene ethers investigated, ethylene glycol ether of pinene (D.H.S. activator) was found to be the most effective activator for pyrethrum and rotenone fly sprays. It reduces the "knockdown" time of pyrethrum sprays in direct proportion to the amount of activator added and increases the killing power by approximately 10% for each 2·5% of activator. The "knockdown" time of solutions containing 50 and 100 mg. respectively, per 100 c.c. and 7·5% safrol in a petroleum oil base was also reduced in relation to the amount of activator added, while the killing power was increased by approximately 5% for each 2·5% of activator. The addition of the activator does not accelerate the deterioration of either pyrethrum or rotenone solutions in petroleum oil bases when they are stored in air-tight tins at room temperatures (70°–80°F.) for 22 months. When the solutions are exposed to sunlight or light in flint glass bottles, the activator increases the rate of disintegration of the active constituents.—W. MOORE.

ANTIPIN, D. N. (1937). Sravnitel'naya otsenka anthel'minticheskoĭ tsennosti tetrakhloretilena i kapsul Shprena pri askaridoze i untsinarioze serebristochernykh lisits. [**A Comparison of the Anthelmintic Efficacy of Tetrachlorethylene and " Sprehn Capsules " against Ascaris and Uncinaria Infestation of Silver Foxes**].—*Papers on Helminthology, Commemorating 30 year Jubilee of K. I. Skryabin.* pp. 23–28. 4 tables. [4 refs.] [English summary]. Moscow : Lenin Acad. Agric. Sci.

Of 30 silver foxes infested with *Toxocara canis*, 16 were treated with doses of 1 c.c. tetrachlorethylene and 14 with 3 " Sprehn capsules " [tetrachlorethylene in gelatin, together with a vehicle of undisclosed constitution : Sprehn claims that this vehicle is an important constituent] per animal. Thirty-four similar foxes infested with *Uncinaria stenocephala* were given the same treatment. No purgatives were given and all animals were killed and examined 3–4 days after treatment.

The results showed tetrachlorethylene to be more effective than " Sprehn capsules " and it is recommended that the administration of the latter be discontinued.—E. MARTIN.

TRUM, B. F. (1940). **N-Butyl Chloride, B.P. 78·5 as an Anthelmintic.**—*Vet. Bull. U.S. Army.* **34.** 20–24.

Eight horses were treated with 0·1 c.c. per lb. body weight of this drug. When given after fasting, the reaction was moderately severe, the excreta had an obnoxious odour and sloughing of the stomach mucosa occurred. Without fasting, no reaction was observed. This drug had no effect on larvae of *Gastrophilus* sp. It was 100 % efficient against both *Trichomonas* [an obvious misprint for *Trichonema* —Ed.] and *Oxyuris equi* in one horse.—R. FISHER.

LANDSBERG, J. W., & ACCOUSTI, N. J. (1940). **Pyrethrum as an Ascaricide, In Vitro Studies.**—*J. Parasit.* **26.** 105–110. 1 table. [10 refs.] [Authors' summary copied *verbatim*].

Various concentrations of the petroleum ether, chloroform, alcohol and tetrachlorethylene extracts, as well as the crude pyrethrum, were studied, by the in vitro method of Lamson and Brown to determine their ascaricide properties. When compared with other anthelmintics, tested by the same procedure, the pyrethrum preparations were found to have no activity. This observation, however, does not eliminate them completely as ascaricides but indicates further studies adequately controlled, in experimental animals and man.

FAURE. (1938). Traitement par le froid artificiel de la spirurose cutanée des équidés. [**Treatment of " Summer Sores " (Cutaneous Spirurosis) in Horses by Local " Freezing "**].—*Ann. Parasit. hum. comp.* **16.** 142–145. 1 fig.

F. describes the treatment of summer sores in horses by local " freezing " with ethyl chloride or carbon dioxide.

FINCHER, M. G., & HAYDEN, C. E. (1940). **The Anterior Pituitary Lobe Hormones in the Treatment of Ketosis in the Dairy Cow.**—*Cornell Vet.* **30.** 197–216. 17 tables. [10 refs.] Discussion pp. 216–217.

Thirteen out of 17 cases of acetonaemia were treated with an anterior pituitary lobe preparation, while the others received either gonadin or " an anterior pituitary-like " preparation. The data are insufficient to draw any definite conclusions, but it appears that the administration of these hormones did have some beneficial effect in the treatment of ketosis in dairy cows.—R. ALLCROFT.

BLACK, D. A. K., POWELL, Joan, & WITTS, L. J. (1940). **Absorption of Iron.**—*Brit. med. J.* May 18th. 810. 1 table. [4 refs.] [Authors' summary copied *verbatim*].

In an experiment designed to test Hiyeda's observation of a two- or three-fold increase in blood iron as a result of iron administration it was found that no significant alteration in blood iron occurred either after a single massive dose or in the course of continued administration of iron.

LICHTENSTEIN, M. (1939). **Cod-Liver-Oil Dressings : Their Mode of Action.**—*Lancet.* **237.** 1023–1026. 5 tables. [Numerous refs.]

A survey is given of the views held regarding the action of cod-liver oil as a wound dressing. It appears to be established that cod-liver oil has a definite bactericidal power and that its value is greatly increased by treatment with ultra-violet rays. It is emphasized that cod-liver oil is non-irritant to the tissues, supplies them with vitamins and possibly other forms of nourishment and mechanically protects the young granulation tissue and epithelium from damage by the cloth coverings. The merits of cod-liver oil dressings are emphasized, and a clinical trial of irradiated oil is advocated.—F. T. BOYLE.

POISONS AND POISONING

STEYN, D. G. (1939). **The Diagnosis of Arsenical Poisoning of Stock.**—*J. S. Afr. vet. med. Ass.* **10.** 151–156. [1 ref.]

About 25,000 specimens were analyzed for arsenic over a period of 14 years. S. discusses peracute, acute, subacute and chronic arsenical poisoning, including diagnosis in living cases. The importance of submitting specimens in separate containers is stressed as the distribution in different organs is very important. In chronic living cases of arsenical poisoning the administration of sodium thio-sulphate will often stimulate the excretion of the poison in the faeces and urine. In peracute cases large quantities of arsenic will be found in practically all organs. The longer the animal survives the less arsenic will be found in the organs and in chronic cases it may be found only in the bone and hair and require special methods of analysis for its detection. In carcasses in an advanced state of decomposition the distribution of arsenic in the organs may not be the same as at the time of death as it may diffuse from the stomach to almost any organ. No arsenic was detected in the bones of cattle which had been dipped at weekly intervals for three years.
—E. M. ROBINSON.

BEATH, O. A., EPPSON, H. F., GILBERT, C. S., & BRADLEY, W. B. (1939). **Poisonous Plants and Livestock Poisoning.**—*Bull. Wyo. agric. Exp. Sta.* No. 231. pp. 104. 66 figs. [Numerous refs.]

This bulletin contains a summary of the research carried out at the Wyoming Experimental Station on plants toxic for livestock. A large part of the observations pertain to plant poisoning of livestock as it occurs under local range conditions. Descriptions of plants, the conditions under which they may give rise to poisoning, and the symptoms and P.M. findings in affected animals are given in detail.

One section of the bulletin is devoted to recent work on the correlation of poisonous plants with certain geological formations. Special reference is made to seleniferous soils, and a list is given of plants growing on such soils which may give rise to selenium poisoning in livestock. It is pointed out that the natural occurrence of selenium in soils is characterized by its stability and resistance to the normal

root action of common plants. Under normal conditions, therefore, cereals, grasses and root crops are not toxic when grown in naturally occurring seleniferous soils, but conditions may arise in which the selenium in the soil becomes available to the roots of such plants, and the roots may then absorb enough selenium to make these grasses and forages poisonous. It is suggested that certain plants which require selenium for normal growth may act as converters of the selenium from the non-available to the available state, in which form it can be absorbed by all types of plants.

A description, illustrated by several excellent photographs of affected animals, is given of the symptoms, P.M. findings and treatment of " alkali disease " or " blind staggers ". A relationship is suggested between this disease and plants whose ash contains one or a number of the following elements :– selenium, molybdenum, arsenic, tin, manganese and copper. Whether all these elements are present in the plant in toxic combination and in sufficient quantities to exert toxic effects is not yet known. It has been established, however, that there is no causal relationship between this disease and the drinking of saline and alkaline waters, and, therefore, the term " alkali disease " is a misnomer. Finally, it is pointed out that selenium is known to be a contributing factor in several forms of malnutrition in stock, *e.g.* by inactivation of calcium metabolism resulting in bone erosion.—N. J. Scorgie.

PHYSIOLOGY

Duncan, C. W., Lightfoot, C. C., & Huffman, C. F. (1940). **Studies on the Composition of Bovine Blood. II. Seasonal Variations in the Level of Magnesium in the Blood Plasma of Growing Dairy Calves.**—*J. Dairy Science.* **23.** 125–134. 1 fig., 4 tables. [14 refs.] [For part I, see *V. B.* **10.** 134].

Following upon the suggestions made in part I that fluctuations in the magnesium content of the blood plasma of growing calves are normal occurrences, the authors studied the determinations already made in order to ascertain the influence of the seasons on the magnesium content.

Lower plasma magnesium values were obtained in those months during which there were more than eight hours of sunshine per day and when the mean and maximum mean temperatures were about 55° and 70°F. respectively. The values obtained from calves which had no access to sunlight corresponded to those of calves turned out to pasture, which suggests that the changes in concentration are not the result of solar radiation.

Factors such as temperature, sunshine, precipitation, barometric pressure and relative humidity have been considered and linear correlations have been indicated to show some apparent relationships with magnesium content of plasma, but no attempt has been made to interpret the data.—H. V. Hughes.

Madden, S. C., & Whipple, G. H. (1940). **Plasma Proteins : Their Source, Production and Utilization.**—*Physiol. Rev.* **20.** 194–217. 1 fig., 2 tables. [Numerous refs.]

This excellent critical review on the origin and metabolism of plasma proteins is written with the object of surveying the relevant literature and, at the same time, the authors have applied an independent interpretation to much of the experimental data covered in this review. The liver is believed to be the primary site of the formation of fibrinogen, albumin and globulin of the plasma, although

it is admitted that some albumin and globulin may be formed in body cells outside the liver. Plasmapheresis experiments [withdrawal of blood followed by reinjection of the plasma-free R.B.C. suspended in physiological saline] have offered the best practical approach to the problems of origin of the plasma proteins. In this way the *basal dietary* protein is found to be wholly responsible for the *basal* output of plasma proteins. The weight of available evidence suggests that the diet regulates both globulin and albumin formation equally well. For the maintenance of weight and N equilibrium some nine or ten amino-acids are essential.

There is abundant evidence for the view that in the animal body there is a reserve store of plasma protein building material. This store, defined as all protein which may be given up by an organ or tissue under uniform conditions without interfering with organ or body function, is believed by the authors to be in *dynamic* equilibrium with the plasma proteins, which according to the former view were regarded as *static*. The mechanism of plasma-protein formation is discussed and the following concept of its metabolism is put forward. Food protein is the ultimate source of constructing materials which on absorption support protein formation throughout the body. Part of this body protein forms a reserve in the sense that it can be depleted without injuriously affecting function ; this reserve is in equilibrium with the plasma proteins. This store can be drawn upon for the manufacture of new cell protein, plasma protein or haemoglobin, the limits of the store being individual characteristics of each organ, tissue and fluid. When the body demands protein, the plasma contributes its quota. The new plasma proteins probably arise from the liver, although some globulins may be formed elsewhere.—ALFRED EDEN.

BENKŐ, S. (1938). Vizsgálatok az egyes háziállatok vérfolyadékának diazo-reakciójáról. **[The Diazo Reaction for the Determination of Bile Pigments in the Blood].**—*Thesis, Budapest.* pp. 12. 4 tables. [Numerous refs.] [German summary].

The quantity of bile pigments in the serum and oxalated plasma of 30 horses, 30 pigs, 20 cattle and 10 dogs was determined by means of the van den Bergh diazo test. [Except for the jaundiced pigs referred to below, the state of health of the animals is not stated.] The presence of bilirubin was verified in the horse serum and plasma samples, but none was demonstrated in the serum or plasma of the cattle, dogs and pigs, with the exception of six sera from pigs affected with jaundice.

The serum of horses had a higher bilirubin content than the oxalated plasma. [No explanation of this difference is offered.] Age and sex of the horses and time of collection of the samples had no influence on the values found, the average being 7·04 mg. % bilirubin in the serum and 5·26 mg. % in the plasma.

The recovery of bile added to certain of the serum samples was not complete, the difference between known and demonstrable bilirubin content being about 50% in horse serum and 15% in pig serum. This is attributed to the binding of part of the bilirubin by the globulins of the serum.—E. MARTIN.

I. HAHN, P. F., BALE, W. F., HETTIG, R. A., KAMEN, M. D., & WHIPPLE, G. H. (1939). **Radioactive Iron and Its Excretion in Urine, Bile and Feces.**—*J. exp. Med.* **70.** 443–451. 4 tables. [10 refs.]

II. HAHN, P. F., ROSS, J. F., BALE, W. F., & WHIPPLE, G. H. (1940). **The Utilization of Iron and the Rapidity of Haemoglobin Formation in Anemia Due to Blood Loss.**—*Ibid.* **71.** 731–736. 1 table, 2 charts. [8 refs.]

I. A study of the excretion of iron in urine, bile and faeces was made by

means of the intravenous injection into dogs of radioactive iron in the form of ferrous gluconate. It was found that an initial extra output, which may total 2–8% of the injected iron, occurred in urine and faeces during 3–15 days following the iron injection. After this the urinary excretion of the radioactive iron dropped to traces or even to zero. The faeces always contained measurable amounts of radioactive iron; from 0·05–0·4 mg. per day were observed. When a large number of red blood cells were destroyed by subcutaneous injection of acetylphenylhydrazine, a definite increase resulted in the amount of radioactive iron eliminated in the faeces and in the bile. Under normal conditions the bile contributes very little iron to the intestine, but, by means of a bile fistula, it was shown that blood destruction increased significantly the elimination of iron in the bile. It is concluded that the body controls its iron stores by absorption or lack of it, rather than by its capacity to eliminate the iron. The experimental evidence shows that the dog excretes iron with difficulty and in small amounts (even in the plethoric state) by means of the biliary and gastro-intestinal tracts.

II. Observations are reported in which radioactive iron was used, since the appearance of this form of iron in the plasma can be followed quantitatively. It is shown that the formation of haemoglobin in the anaemic dog takes place at a very rapid rate, radioactive iron being detectable in the circulating red cells four hours after feeding. The absorbed labelled iron was entirely converted into haemoglobin within 4–7 days under standard anaemic conditions but when red cell production was accelerated by iron feeding or by dietary factors, or when the dose of iron was very small it could be converted to haemoglobin in 2–3 days. In general, the absorption of radioactive iron as shown by haemoglobin regeneration in anaemic dogs was found to be more efficient after small doses in single feeding experiments; as the iron intake was increased the percentage absorption fell rapidly.

[The iron used in these experiments was converted to the radioactive isotope by means of the cyclotron [*V. B.* **9.** 587.] and, although only an infinitesimal fraction of the total iron in the target is rendered radioactive by this procedure, it appears that this radioactive fraction affords a quantitative means of labelling the whole iron sample or any portion of it, regardless of the pathway it may take in the course of its biological utilization. The chemical and biological evidence indicates that the increased atomic weight of the radioactive isotope would not be enough to produce any appreciable difference in utilization from that of the ordinary isotopes with which it is mixed. Therefore, the total iron sample containing the radioactive iron is considered as a " labelled iron " for the purpose of feeding or injection experiments, and the terms " labelled iron " or " radioactive iron " are used interchangeably to indicate the whole labelled iron sample or fraction thereof.

Certain isotopes, which are elements of the same chemical properties but of different atomic weights, are radioactive, *i.e.*, emit emanations through which their presence can be quantitatively detected in tissues. Radioactivity is the property of emitting invisible penetrative rays, which arise from the spontaneous disintegration of the nucleus of the radioactive atom.—Ed.]—R. Allcroft.

Schoenheimer, R., & Rittenberg, D. (1940). **The Study of Intermediary Metabolism of Animals with the Aid of Isotopes.**—*Physiol. Rev.* **20.** 218–248. [Numerous refs.] [See also explanatory note to previous abst.]

Isotopes of the elements constituting organic matter provide tools with which this matter can be readily studied in the intact and living animal. Two types are available (1) the natural stable isotopes of H, O, N, C and S and (2) a large number

of artificially produced radioactive isotopes. The present review is concerned with the metabolism of organic compounds involving radioactive P and S, heavy H (deuterium) and N. Heavy O has not been used much so far. The present methods for following metabolic reactions are described. Details of the various methods for the analysis of isotopes in organic compounds are given. The isotope metabolisms of various food and body constituents are dealt with, including (1) fatty acids, in which so far only deuterium has been used as a marker, phospholipides (using radioactive P) and the steroids ; (2) carbohydrates, although no experiments have yet been carried out with isotopic sugars (3) proteins, in which the fate of dietary N, replacement of amino-acids in protein deamination, and various isotopic amino-acids are considered ; (4) the metabolism of creatine and creatinine and (5) phosphorylation in muscles. There is a discussion of isotopic compounds as indicators for chemical reactions of body constituents. Some interesting light has been thrown on enzyme action by these studies ; experiments indicate that all reactions for which specific enzymes and substrates exist in the animal are carried out continually. Special conditions are unnecessary for these reactions ; the best experimental subject is the normal adult animal on its normal diet.

[Studies of this kind are important not only from the fundamental physiological standpoint, but also in relation to the study of animal disease. For example the rate of change of bone tissue in skeletal disorders such as aphosphorosis or fluorosis could easily be followed by using radioactive P as a labelled fraction. The P already in the skeleton is not radioactive so that appearance of the labelled form would indicate the extent of fresh mineralization of bone, and throw light on the mechanism of deposition of both Ca and P.]—Alfred Eden.

Dick, A. T. (1939). **The Effect of Severe Haemorrhage on the Concentration of Copper in the Blood of Sheep.**—*Aust. J. exp. Biol. med. Sci.* **16.** 271–274. 1 fig. [7 refs.]

D. discusses the conflicting data obtained by various workers, some of whom report large increases in blood copper subsequent to the withdrawal of blood, whilst others record considerable reductions. In sheep it was found that the anaemia resulting from the loss of large volumes of blood (up to 25 c.c. of blood per kg. body weight) was not followed by any disturbance of the concentration of copper in the blood, the latter remaining at the normal level of 0·10–0·15 mg. Cu per 100 c.c. blood.—M. C. Franklin.

Eden, A. (1940). **The Fate of Ingested and Injected Copper in the Animal Body.** —*Abst. Diss. Univ. Camb. 1938–39.* pp. 20–21. [Copied *verbatim*].

An improved rapid wet combustion variation of the McFarlane method for micro-estimation of copper in biological material is described, enabling thirty determinations to be completed in 8 hours.

Normal blood values for horses, cattle, pigs, sheep, and rabbits range from 0·06 to 0·15 mg. % of copper, the distribution being approximately even over corpuscles and plasma ; the values for human beings are somewhat higher. There is no definite relation between copper in blood and in food except in chronic poisoning. The blood level (rabbits and sheep) may be artificially raised ten times by intravenous injection of cupric sulphate without causing toxic symptoms, and this is followed by rapid logarithmic fall to normal within 8–24 hours. If, however, the level is raised fifteen to twenty times, death ensues. High but non-toxic doses of cupric sulphate given by stomach tube in solution, and presumably flushing the duodenum, cause a moderate temporary rise in blood copper, reaching a maximum within 8 hours, but the same solution *dried* on to the daily food causes no rise.

For the rabbit, doses of 2·5 mg. per kg. produce acute intoxication by intravenous injection ; the same effect is produced by twenty times this dose given in solution by stomach tube, but this higher quantity can be given daily for long periods without harm if previously dried on food. Data for the distribution of copper over the soft tissues are given for normal animals and after acute and chronic intoxication, values being highest in liver and lowest in muscle. The relatively high normal copper content of the liver of newborn rabbits falls to adult level in about 6 weeks.

Chronic copper poisoning can be experimentally produced by adjustment of long-continued dosing. In the case of the sheep 1·5 g. cupric sulphate given daily induces clinical symptoms and death in upwards of 30 days. In addition to dullness, depression, and occasional anorexia, blood haemoglobin gradually falls but blood copper remains comparatively normal until the " sharp pre-mortal rise " associated with final symptoms. Post-mortem examination reveals yellowish cirrhotic liver and generalized icterus with liver copper twenty to a hundred times the normal ; apart from an intermediate value for kidneys, other tissues show relatively little deviation from normal copper content.

By the use of a specially designed metabolism cage, it was found that rabbits in copper equilibrium on normal diet excreted most of the food copper in the faeces, only 4% appearing in the urine. Intravenously injected copper is also excreted mainly by the intestine after temporary storage in the tissues ; of 3 mg. copper as cupric sulphate, so introduced, 17% was eliminated by the urine within 48 hours, but almost the whole of the remainder appeared in the faeces in gradually diminishing quantities over 3 weeks. By oral administration very much larger quantities are almost entirely eliminated by the faeces ; 50 mg. given by stomach tube caused a temporary rise of urinary output corresponding to about 1% over 24 hours, but the remaining 99% appeared in the faeces over the ensuing month. Of the same quantity dried on to bran, only 0·2% appeared in the urine. The slow rate of appearance of ingested copper in the faeces is tentatively explained by temporary fixation by the alimentary mucosa.

DE VILLIERS, O. T. (1938). **The Blood of the Ostrich.**—*Onderstepoort J. vet. Sci.* **11.** 419–504. 2 text figs., 16 figs. on 1 plate, 30 tables. [Numerous refs.]

The author commences with a history of the ostrich and refers to the importance of the ostrich feather industry for many years and its subsequent decline. He made an extensive study of the blood of the ostrich, on three males and three females which were under constant observation, and on a number of others, some of which were worm infested. Methods are described for marking ostriches and taking blood samples. Lithium citrate was used to prevent coagulation but was later replaced by heparin. Ostrich blood has a very long coagulation time and may fail to clot unless it comes in contact with the tissues when drawn. Wiseman's method for counting leucocytes was found to be the most suitable for ostrich blood. The erythrocyte of the ostrich is very large, but the blood count is the lowest recorded for birds or mammals. The resistance of the red corpuscle is about the same as that of the fowl. Regeneration of erythrocytes is very marked in ostrich blood and polychromasia very evident. Basophile erythroblasts are common in the blood. Leucocyte and thrombocyte counts show considerable variation, particularly the latter which may be exceptionally high. The percentage of lymphocytes is much lower than that recorded for the fowl, but the heterophiles show a higher percentage. The basophile of the ostrich is distinct from that of the fowl. The average total volume of blood in the body of the ostrich was found to be 5,466 c.c. which was 5·8% of the body weight. A variation of 5,220–6,355 c.c. was found over a series of birds.—E. M. ROBINSON.

HESTER, H. R., ESSEX, H. E., & MANN, F. C. (1940). **Secretion of Urine in the Chicken (Gallus domesticus).**—*Amer. J. Physiol.* **128.** 592–602. 5 tables. [9 refs.]

Following the experiments of numerous other workers, observations on urine secretion in 12-months-old male and female chickens have been made by (1) cannulation of the ureters, (2) application of a funnel to the urodaeum and (3) exteriorizing the ureters. The last method was the most successful and the largest daily output of urine in birds so treated was 123·5 c.c. The authors found that samples collected immediately after handling birds were large, the interference apparently causing diuresis, and this probably explains the large volumes obtained by other authors. The urine consisted of a thick, cream coloured, mucoid mass containing an abundance of urates.

The authors consider that urine secretion in the bird resembles the same process in the mammal, the cloaca acting as the bladder and storing the urine. Claims that water is absorbed from the urine by the cloacal mucous membrane are doubted.—H. V. HUGHES.

I. LUY, P. (1939). Betrachtungen zur Physiologie der Magenverdauung, insbesondere der Wiederkäuer. [**Observations on Physiology of Digestion, especially of Ruminants**].—*Wien. tierärztl. Mschr.* **26.** 508. [Also appeared in *Berl. Münch. tierärztl. Wschr.* Sept. 15th. 579. (1939)].

II. GRAF. (1939). Ueber Arzneiwirkungen am Wiederkäuermagen. [**Effects of Drugs on the Ruminant's Stomach**].—*Ibid.* 508–510. [Also appeared in *Berl. Münch. tierärztl. Wschr.* Sept. 15th. 579–580. (1939)].

I. This is an abstract of a lecture given to the Vienna Microbiological Society. The subject was dealt with on a broad phylogenetic basis. The symbiotic existence of bacteria and infusoria in the alimentary canal of the horse and cow was discussed in relation to the digestion of cellulose.

II. The physical properties of the contents of the rumen can be affected by mucilaginous substances which exert a favourable influence when the content is too dry. Excessive formation of gas, mainly CO_2, may occur in only slight disturbances and then drugs such as ethereal oils, ammonium hydroxide, formalin and phenol compounds are indicated. These act upon the walls of the fore-stomachs, since they are too diluted to have any effect upon the bacteria.

Sodium salts have an uncertain action in closing the oesophageal groove; their action appears to be independent of their concentration; incomplete closure of the groove allows the passage of drugs into the reticulum and rumen, and their effect is localized to the wall in these regions. Absorption of crystalloids in solution and highly dispersed colloids accounts for the uncertain results obtained with some drugs; high concentration of a stimulating drug in one small area of stomach surface—as may happen if a small quantity of concentrated agent is administered—leads to local absorption and inhibition of the normal activity of the fore-stomach. The action of veratrine and antimony tartrate is probably due to reflex stimulant action on the muscle, due to direct contact with the drug.

Stimulating drugs affecting the parasympathetic system must be used with caution, as they cause only an increase of tonus of the musculature and not greater contraction and relaxation. There is no occasion for the use of inhibitory drugs such as atropine and adrenaline in the treatment of digestive disorders of ruminants.

—A. T. PHILLIPSON.

TECHNIQUE AND APPARATUS

LANGNER, P. H., Jr., & FORRESTER, J. S. (1939). **The Disintegration of Bacteria by Mechanical Means, I. Description and Capabilities of a New Type of Ball Mill. II. Comparative Efficiency of the Low Temperature Ball Mill and the Sonic Oscillator.**—*J. Immunol.* **37.** 133–140. 1 fig., 2 tables. [8 refs.]

FORRESTER, J. S., & LANGNER, P. H., Jr. (1939). **The Disintegration of Bacteria by Mechanical Means, III. Comparative Reactions after Intracutaneous Injection of Filtrates of Mechanically Disintegrated Bacteria and of Heat Killed Whole Organism Suspensions.**—*Ibid.* 141–148. 3 tables. [7 refs.]

I & II. The authors describe a mill for use in grinding dried bacteria either at low temperatures or at room temperature and capable of dealing with the growth of from 5–10 litres of broth culture.

From observations made with a variety of organisms, it was found that usually from 20–40% of the total bacterial nitrogen was rendered soluble after grinding for three hours and could be recovered after Berkefeld filtration. Microscopic examination of the stained unfiltered bacterial debris after grinding for this period revealed amorphous Gram-negative debris; only rarely could whole organisms be found. A comparison of the effectiveness of grinding at a low temperature and at room temperature was made with dried haemolytic streptococci and *Bact. coli.* In each case, as judged by microscopic examination of the bacterial debris and by the percentage of total nitrogen in a Berkefeld filtrate, the results of grinding at room temperature compared favourably with those at the low temperature.

It was also found possible to disrupt the bacterial bodies by grinding a packed wet mass of the organisms at room temperature. The mill was capable of grinding bodies larger than bacteria, *e.g.* after three hours of grinding of ragweed pollen, microscopic examination revealed mainly small granules and only a few intact pollen grains could be found.

III. The results are reported of comparative intradermal tests with the soluble products of mechanical bacterial disintegration and the conventional heat-killed organism suspension. The organisms used included a haemolytic streptococcus of Lancefield's Group A (NY5), a non-haemolytic streptococcus, a haemolytic *Staphylococcus aureus*, *Streptococcus viridans* and strains of *Haemophilus influenzae* and *Brucella abortus.* The patients selected for intradermal tests were nine affected with chronic asthma, nine with rheumatoid arthritis, five with hay fever, five with diseases of non-allergic natures and three normal persons. Eleven patients were selected for retesting with different preparations of the haemolytic streptococcus and the staphylococcus. There was no consistent difference in the intensity between intradermal reactions to test substances killed by heat and those to the filtrates prepared from ground-up material.—F. T. BOYLE.

SÄHLSTEDT, V. (1939). En apparat för slakt av fjäderfä. [**An Apparatus for Killing Poultry**].—*Svensk VetTidskr.* **44.** 416–420. 1 fig.

This hand apparatus consists of a spring- and trigger-actuated guillotine blade which breaks the neck of a bird, and an exposed razor-shaped blade which completes the severance of the head. Fowls can be decapitated with it in about half a second. The instrument conforms with the Swedish animal slaughter regulations and seems to satisfy the requirements of Jewish ritual.—J. E.

BIGGER, J. W., BLACKLOCK, J. W. S., & PARISH, H. J. (1940). **Sterilization of Syringes and Needles.**—*Brit. med. J.* April 6th. 582–583.

Where large numbers of inoculations are carried out regularly, syringes and needles, after being dismantled where necessary, should be placed while still wet in suitable containers, *e.g.* test tubes with parchment covers, and sterilized in the autoclave.

In general practice syringes and needles should be boiled for 15 minutes in a 1% phenol solution. Test tubes into which the syringes and needles can be placed may also be sterilized as above. Such test tubes should be plugged with a sterile rubber cork and not by unsterilized cotton wool.

Syringes used for aspiration of pathological fluids should be boiled for 15 minutes before use, after previous sterilization by boiling for half-an-hour in 5% phenol. No reliance should be placed on rinsing with water which has been sterilized and stored. Sterile water, if to be stored, should be hermetically sealed in a glass container immediately after sterilization.—F. T. BOYLE.

MISCELLANEOUS

SOUTHALL, J. (1939). **The [Army] Veterinary Service of Burma.**—*J. R. Army vet. Cps.* **11.** 6–8.

The Burma frontier force has sixteen, and the Army has two veterinary assistant surgeons. There is a government stud farm and plans have been made for a new veterinary hospital and army veterinary school.

Glanders is prevalent, but all remounts to the Defence Force now undergo the mallein test. Vaccination against anthrax is carried out annually. There have been no outbreaks during the past two years of either anthrax or surra.—H. V. H.

SHAH, S. M. A. (1939). **Veterinary Work in the North-West Frontier Province, India.**—*Vet. J.* **95.** 17–24. 4 figs. on 2 plates.

An account is given of the history of veterinary work in the Province. Much attention is given to improvement of the local breeds of cattle for milk production and for draught purposes. A brief description is given of cattle, sheep and goat breeding. Angora goats have been introduced to improve the goats of Kaghan Valley with a view to developing mohair production in the Province. Efforts are being made to improve the milking capacity of the local buffaloes in order to increase the output of ghee (clarified butter), which is now imported from the Punjab. Horse, mule and camel breeding are mentioned. The greatest drawback to the development of the poultry industry is the incidence of contagious diseases.

There are 73 dispensaries in the Province in addition to 17 hospitals. Rinderpest is the main cause of losses of cattle ; the disease is being controlled by the use of goat-tissue vaccine. Haemorrhagic septicaemia is also a cause of serious losses ; this is controlled by the use of vaccine in the enzootic areas. Foot and mouth disease is common, but does not cause serious losses ; permanent foot baths are used at the cattle fairs as a preventative. Blackleg occurs sporadically. Surgical and non-contagious diseases are treated at the hospitals and by the touring officers. Veterinary education is fostered by means of scholarships to students deputed to veterinary colleges. Propaganda to inform the public of the benefits to be obtained from the services of the veterinary staff is fostered by the department.—J. A. G.

HENDERSON. (1938). **" The Improvement of Livestock " [In Nigeria].**—*3rd W. Afr. agric. Conf. 1938.* **2.** 63–67. Discussion pp. 67–72.

H. considers that before any large-scale scheme of livestock improvement

could be introduced the serious local animal epizootics must be brought under control. Rinderpest is the most serious of the diseases of cattle in Nigeria and in most West and East African territories, and H. advocates its control by the serum-virus method (double inoculation) or by the use of spleen vaccine. The diseases caused by protozoan parasites which are transmitted by either flies or ticks are considered, with special reference to trypanosomiasis. There is no actual immunity set up by an attack of this disease although the animals can, and often do, acquire a definite resistance or tolerance, but this balance is easily upset by any factor which causes a loss of vitality. This resistance, besides being variable in degree in different animals, is definitely specific for the particular type or types of infection to which they have been exposed. Such a factor is important in the problems connected with livestock development in Nigeria and it has been found that cattle intended for use in any given tsetse area should for preference be born and reared in that area.

In the discussion which followed this address, problems concerning the improvement of livestock were considered.—R. ALLCROFT.

—. (1939). Les élevages au Congo Belge en 1937. Province de Stanleyville. **[Livestock Breeding in the Belgian Congo in 1937 (including Notes on Diseases)].**—*Bull. agric. Congo belge.* **30.** 218–226.

The great majority of the 102 European-owned herds held on an average less than 200 head of stock. In Stanleyville the cattle are mostly Friesian Shorthorns, but in Ituri the Europeans now attempt improvement of indigenous stock by selection. The native breeders, too, have abandoned out-crossing.

It is apparent that the future of European breeding activities depends upon improvement of pasture, and to that end the enclosure of land and the methodical cultivation of grass are advocated. The benefits of part-time housing of cattle have been demonstrated and it is considered that cattle on all farms should consist of a limited number of selected cross-bred animals, to be managed intensively for milk production, and a more numerous herd of indigenous cattle for extensive husbandry on the poorer pastures for the production of meat. Some European farmers have specialized in the fattening of cattle bought as stores from the natives. The price of beef made the enterprise profitable. The price paid for fattened pigs, on the other hand, did not cover the cost of feeding.

Four Government co-operative dairies were run to the great advantage of native farmers.

A methodical campaign against trypanosomiasis in the zone of Aru is described. All cattle in the zone of Bunia were vaccinated against blackleg.—G. WILLIAMSON.

LARRAT, M. (1939). Le veterinaire indigène. **[Native Veterinarians in French West Africa].**—*Bull. Serv. zootech. Epiz. A.O.F.* **2.** No. 2. 55–60.

An account of native methods of dealing with animal disease.—H. V. HUGHES.

EDEN, A. (1940). **Coprophagy in the Rabbit: Origin of ' Night ' Faeces. [Correspondence].**—*Nature, Lond.* **145.** 628–629. [2 refs.]

A rabbit was fed a daily ration of a mixture of equal parts of bran and oats; after a preliminary period of a week, during which time the ordinary faeces were collected, the animal was provided with a wooden collar sufficiently large to prevent prehension of faecal pellets from the anus, and the " day " and " night " faeces were then collected separately. Analysis revealed that the " day " faeces corresponded closely with those of the uncollared period, but that the " night " faeces differed not only in their higher total ash content [see *V. B.* **10.** 635.], but also

in containing a much higher percentage of crude protein and a much lower percentage of crude fibre. On a dry matter basis, the " night " faeces were found to contain 28·5% of crude protein, of which 25% was insoluble after treatment with $Cu(OH)_2$ and about half was soluble when incubated at 37°C. with pepsin-HCl.

In a second experiment, a collared rabbit was provided with the same diet of bran and oats for four days, the " night " faeces being collected, and was killed just before feeding-time on the morning of the fifth day. Analysis revealed a striking similarity between caecal contents and " night " faeces in respect of crude protein, total ash, P_2O_5, Na_2O and K_2O.

E. suggests that the great increase in crude protein of the " night " faeces is due to bacterial debris, and that the intestinal rhythm responsible for the production of the two types of faeces may consist of " a partial filling of the deeper regions of the caecum as the food contents pass on from the small intestine, associated with a partial more direct passage of digested material into the colon during the day, followed by extensive emptying of the deeper regions of the caecum at night."

—ALASTAIR N. WORDEN.

DUBOS, R. J. (1938). **Studies on a Bactericidal Agent Extracted from a Soil Bacillus. I. Preparation of the Agent. Its Activity in Vitro. II. Protective Effect of the Bactericidal Agent against Experimental Pneumococcus Infections in Mice.**—*J. exp. Med.* **70.** 1–10 and 11–17. 6 tables. [20 refs.]

I. A Gram-positive, spore-bearing aerobic bacillus, capable of lysing the living cells of many Gram-positive microbial species, has been isolated from soil. Cultures of this soil bacillus in peptone media released during autolysis a soluble agent which exerts a bactericidal effect on all the Gram-positive micro-organisms so far tested, and inactivates their glucose dehydrogenases. It also inhibits the growth of the susceptible species in culture media. Several of the Gram-positive species undergo lysis when incubated with the bactericidal agent. It appears, however, that lysis is only a secondary process, due to the autolytic enzymes of the susceptible cells, and that it follows upon some other primary injury caused by the active agent.

II. The agent protects mice against infection with large numbers of virulent pneumococci. It also exerts a curative effect when administered to mice several hours after injection of the infecting organisms. The degree of protection afforded and the minimal effective dose of bactericidal agent are approximately the same for all virulent pneumococci, irrespective of type specificity. The agent is ineffective against infection with Friedländer's bacillus (type B).—J. M. ROBSON.

MACLEOD, C. M., MIRICK, G. S., & CURNEN, E. C. (1940). **Toxicity for Dogs of a Bactericidal Substance Derived from a Soil Bacillus.**—*Proc. Soc. exp. Biol., N.Y.* **43.** 461–463. 1 fig. [2 refs.]

Short-haired dogs, weighing from 8–12 kg., were used in a study of the toxicity of a protein-free preparation of the bactericidal substance described by DUBOS [see above]. The substance was dissolved in alcohol and dilutions of the alcoholic solution in 20 c.c. of a 5% glucose solution in redistilled water were used for intravenous injection. Seven of the eight animals which received 0·4 mg. per kg. of body weight or more daily, died as a result of the injections, and in six of these death occurred before the course of ten daily injections was completed. All animals receiving 0·3 mg. per kg. or more showed well marked, acute or chronic changes in the liver, spleen, kidneys, heart and lungs. Animals which received daily 0·2 mg. per kg. or less for ten days showed only minor evidence of toxicity.

—R. ALLCROFT.

HASSALL, A., DOSS, M. A., FARR, M. M., CARSON, G. B., & BERO, D. (1939). **Index-Catalogue of Medical and Veterinary Zoology. Part 3. Authors: C to Czygan.** pp. 961. Washington, D.C.: Govt. Printing Office. [8vo] [40 cents].

A list of references, arranged alphabetically under authors, covering the literature from the time of Cuvier (1798) to 1937, inclusive.—E. S.

OFFICIAL AND OTHER REPORTS

GREAT BRITAIN. (1940). **Annual Report for 1939 of the Principal of the Royal Veterinary College.**—*J. R. agric. Soc.* **100.** Pt. III. 128–131.

Investigations carried out have been chiefly connected with MASTITIS, ABORTION and BOVINE STERILITY. Some work was also done on EQUINE PNEUMONIA. Reference is made to an organism (unnamed) stated to have been found frequently associated with bovine sterility.

Some outbreaks of ABORTION in ewes appeared to be due to severe weather and grazing restrictions owing to frost; in others no definite evidence of the cause was obtained. In one outbreak there was evidence that it was due to a vibrio.

Studies of *Bacterium coli* associated with WHITE SCOUR in calves were continued and attempts were made to isolate the toxic fraction by chemical means. A technique has been developed for extracting a bacterium-free substance extremely potent for calves and less so for small experimental animals.

Work on OVINE MASTITIS due to staphylococci continued. A study was made of the value of toxoid for prophylaxis.

Further attempts were made to improve the methods of isolating *Mycobacterium johnei.*

A study was made of the type of bacillus found in naturally occurring cases of TUBERCULOSIS in the dog.

Work on LIVER CIRRHOSIS in the pig continued and included an investigation of " milk spot " liver.

A preliminary study was made of the control of streptococcal infections in dogs by drugs of the sulphanilamide group.—F. T. BOYLE.

GREAT BRITAIN. (1940). **Report of the Medical Research Council for the Year 1938–1939.** pp. 171. [Numerous refs.] London: H.M. Stat. Off. [8vo] [3s.]

The main sections of the report are :– an introduction, describing briefly the general nature of the research work covered; the work of the National Institute of Medical Research; the determination of biological standards and methods of biological assay and measurement; external research schemes and research work aided by grants; research in tropical medicine, and travelling fellowships. The composition of the investigation committees for special subjects is given in an appendix.

A grant-in-aid of £265,000 was voted by Parliament during the financial year, £10,000 being allocated to administrative and travelling expenses of the Council, £60,000 to the National Institute for Medical Research at Hampstead and the farm laboratories at Mill Hill, £95,000 to research grants for scientific work elsewhere and £30,000 for new buildings required for research in chemotherapy. Important additions to this public monetary grant were received from other sources.

The National Institute for Medical Research

Viruses.—The virus of louping ill was used in the study of infection by neurotropic viruses, as it is transmissible to rats and these show no signs of cerebral infection. Work continues on the dimensions and properties of viruses, applying ultrafiltration and centrifugal methods.

Endocrinology.—An account is given of the preliminary work of Parkes and Hammond at the Animal Nutrition Institute, Cambridge, on artificial induction of fertility in sheep. Extract of horse pituitary gland, containing a follicle-stimulating hormone, was injected (a) in some sheep, just before oestrus and following mating and (b) in other sheep, during anoestrus. The investigations suggest the possibility of stimulating and controlling the reproductive powers of sheep. The work is now being extended to large-scale field experiments.

Neuromuscular Physiology.—Goats of a strain affected with congenital myotonia were sent from the U.S.A. for study. It was found that there was an abnormal response of the muscle fibres to any kind of stimulus, quite apart from the neuro-muscular apparatus.

External Research Schemes

A very wide range of subjects was studied at outside institutions with the help of monetary grants from the Council ; several of them are of veterinary interest. At Cambridge, Griffiths completed his investigations of the typing of tubercle bacilli in the sputum in human cases of pulmonary tuberculosis. Further experiments on the golden hamster and the field vole, with tubercle bacilli and the vole strain of acid-fast bacilli (Wells) have been carried out. Fildes, Gladstone and McIlwain have worked on the nutritive factors required by streptococci and other organisms, and the interrelationship between amino-acids in the nutrition of *Bacillus anthracis.*

Biological Standards

Arrangements for the re-standardization of tuberculin are in progress, in view of the probability that " old tuberculin " may be superseded by the so-called " synthetic medium tuberculin ". Work on the P.P.D. (purified protein derivative) of the new tuberculins is in progress. Work was also continued on the standardization of tetanus toxin and toxoid, gas gangrene antitoxin, vitamins and sex hormones. An account is given of the work of the National Collection of Type Cultures of Micro-organisms.—J. C. Wallace.

India. (1939). **Annual Report of the Imperial Council of Agricultural Research for 1938–39.** pp. vi + 170. 11 appendixes. Delhi : Govt. India Press. [8vo] [Re. 1 As. 8 or 2s. 3d.]

Veterinary investigation officers in the several provinces and Hyderabad State carried out work on problems connected with anthrax, bovine brucellosis, tuberculosis, Johne's disease, Newcastle disease, horn cancer, helminth infection, foot and mouth disease, surra, and experimental work in collaboration with the Imperial Veterinary Research Institute, Muktesar.

A systematic protozoologist is now carrying out bionomical investigations into the various protozoa concerned with disease in domestic animals. In Madras a scheme has been approved for a scientific study of indigenous drugs of reputed efficiency, and of poisonous plants. In the case of drugs likely to be of therapeutic value in veterinary practice, their actions, uses and doses are to be assessed. A veterinary officer has been appointed to investigate the indigenous system of treatment of cattle in India.

In the Johne's disease investigation scheme the reliability of " johnin " as a diagnostic agent was further studied, as well as the chemical composition of Johne's bacillus and the value of treatment with chaulmoogra oil administered *per os*. A scheme sanctioned by the Council in 1934, for a comprehensive study of the various aspects of the use of goat virus as a vaccine in immunization of cattle against RINDERPEST, terminated in March 1938. The conclusions reached may be summarized as follows :– fixed Muktesar goat virus is virulent for goats, but has low virulence for cattle of indigenous breeds and Bengal buffaloes. A local strain has been found safe for cattle after the 40th passage through goats, and for buffaloes after the 80th passage. Blood and tissue vaccines, prepared from either strain, have been proved efficacious. Serum-virus inoculation is recommended for immunization of imported cattle and milch buffaloes. Immunity after the use of blood-virus vaccine has proved solid up to 3½ years after treatment. The statement is made that its advantage apart from low cost, is that " if extensive inoculations are carried out in an area on a prophylactic basis, the chances of spread of infection from vaccinated to non-vaccinated animal are very remote ".

The warble-fly research scheme has disclosed the geographical distribution of the fly. The Punjab and the N.W. Frontier Province are most heavily infested, and it is fairly common in the United Provinces and the hilly tracts of Bengal. Areas with little or no rainfall after the winter months seem well suited for safe completion of the life-cycle of the parasite. Seasonal calendars are being drawn up to show the months in which the pest occurs in various parts of India. It was noted that infested animals lost condition while the larvae remained in the tumours on the back, but that they rapidly regained condition when these disappeared. Observations have also been made regarding the habits of the fly.—J. A. GRIFFITHS.

CYPRUS. (1939). **Annual Report of the Veterinary Service for the Year 1938.** [ROE, R. J.] pp. 7. 1 table. Nicosia : Cyprus Govt. Printing Office. [fcp].

GENERAL.—Climatic conditions were generally favourable to livestock. There was good pasturage, and forage for equines and cattle was cheap and plentiful. The general condition of livestock throughout the year was good, and there was little serious disease. The animal census was as follows :– horses 4,023, mules 10,879, donkeys 54,087, camels 796, cattle 40,267, goats 171,712, sheep 283,151 and swine 22,301. New legislation introduced in 1938 allowed of more effective control of dairies and cowsheds. Meat inspection supervision had been extended, and new abattoirs had been erected. Echinococcosis and lungworm lesions were the chief causes of condemnations at all centres.

ANIMAL DISEASES.—Control of ANTHRAX by compulsory vaccination had again been effective. 567,959 animals (mainly sheep and goats) were vaccinated. To increase the protection in goats nearly 17,000 goats were inoculated with full doses of sheep vaccine about 14 days after inoculation with the more attenuated goat vaccine. No cases of anthrax occurred in these goats and it was proposed to apply the method more extensively in 1939.

The country remained free from BOVINE TUBERCULOSIS and CONTAGIOUS ABORTION ; SHEEP POX and GOAT POX, formerly endemic, did not recur. Parasitic infestations continued to cause losses, but these were less severe than usual. Although drugs for treatment were issued, it was felt that little progress would be made until general animal husbandry methods were improved. In treatment for LIVER FLUKE INFESTATION it was the practice to inject carbon tetrachloride directly into the rumen. Sheep dipping had become a routine practice in many parts of the colony.

The preliminary survey of the incidence of Ox Warbles, mentioned in the 1937 report [*V. B.* **9.** 439.] was continued, and a three-year eradication scheme was approved by Government in May. The scheme provided for monthly examinations of all bovines from December to April. Dressers were provided with dandy-brushes for removing crusts, and a special holder for applying the derris emulsion used. Careful records were to be kept of each owner's cattle. 39,000 cattle were dealt with in December.

A form of Dermatitis of equines appeared for the first time in the country. This was relatively mild but widespread, and principally affected donkeys. It occurred in low-lying districts and was found in equines of all ages except young foals. A description of the lesions is given. Attempts to find a causal organism failed, and transmission experiments were unsuccessful.

Research.—Owing to transfer of the Veterinary Officer, research and routine laboratory work were much curtailed.

Preparation of Anthrax vaccine and of Fowl Pox and Fowl Typhoid vaccines was undertaken. Laboratory experiments on the double vaccination of goats against anthrax preceded the field trials previously mentioned. Two tape-worms not hitherto recorded from Cyprus were encountered, *viz.*, *Raillietina echinobothrida*, from the small intestine of the domestic fowl, and *R. micracantha* from the small intestine of the pigeon.—H. E. Harbour.

Palestine. (1939). **Report by the Chief Veterinary Officer for the Year 1938–39.** [Smith, J. M.]—*Rep. Dep. Agric. Palestine, 1938–39.* pp. 30-46. 8 tables.

The year under review was an extremely good one for livestock. General conditions as a result of well-distributed rainfall were excellent, natural pastures being comparatively abundant throughout the year. The work of the Department was considerably hampered by the disturbed state of the country (two officers were killed). Palestine was free from any serious epizootic throughout the year.

Foot and Mouth disease continues to be a problem; the disease has now appeared in a more virulent form. There were no outbreaks of Rinderpest or Contagious Bovine Pleuro-Pneumonia and no cases of Haemorrhagic Septicaemia or Blackleg were reported during the year. Losses of dairy cattle from tick-borne diseases are considerable at all seasons of the year even though regular dipping is practised. A mutual cattle insurance society, which insures 10,000 cattle, had 656 of these affected with tick-borne diseases, and of these 142 died (approx. 22%). *Theileria annulata* was responsible for 85 of these deaths, Piroplasmosis for 27 and Anaplasmosis for 18. There was no serious loss of native cattle, sheep and goats from this cause, even though dipping was only practised on three or four occasions; the number then dealt with was over 45,000. The incidence of Tuberculosis is said to be increasing among dairy cattle. The various forms of mastitis, including *Streptococcus agalactiae* infection play a considerable role in causing losses to stock owners. Anthrax is enzootic, and 109 deaths were confirmed. Dairy cattle are vaccinated annually with good results. One case of Johne's Disease was diagnosed.

Among equines, there were 42 cases of Dourine, 17 of Epizootic Lymphangitis and 51 of Glanders, the latter being an increase in the incidence. In spite of the disturbed situation active measures have been taken to suppress the disease, mallein reactors being slaughtered with payment of compensation.

Other diseases mentioned are:– Swine Fever which was diagnosed for the first time, a single outbreak being recorded; Sheep and Goat Pox, with three sporadic outbreaks in which the mortality was low; Rabies, 87 cases, the lowest

number for five years. Poultry diseases referred to include FOWL POX, 57 outbreaks, SPIROCHAETOSIS 45 outbreaks, and SALMONELLA INFECTION in chicks and ducklings. *S. aertrycke* infection in rabbits was diagnosed for the first time. Bee diseases are controlled by the Department; of 40 combs examined, 17 were infected with European and 19 with American foulbrood.—J. A. GRIFFITHS.

CEYLON. (1940). **Report of the Government Veterinary Surgeon for 1938.** [CRAWFORD, M.] pp. 13. 8 tables. Colombo: Ceylon Govt. Press. [8vo].

On the whole, the year was free from serious outbreaks of disease. FOOT AND MOUTH disease occurred in all provinces, but the total number of cases was much lower than in the previous year (2,021 as compared with 5,406). C. states that the disease appears to be more severe at intervals of roughly five years. Now that RINDERPEST has been eliminated, F. & M. disease presents the most serious problem to dairymen of Ceylon. Outbreaks of BLACKLEG and HAEMORRHAGIC SEPTICAEMIA appear to be more frequent. ANTHRAX was confined to 38 goats among consignments from India and ten cases which occurred in the Central province. No cases of BOVINE TUBERCULOSIS were detected in any abattoir among the 47,264 carcasses examined by veterinary surgeons at Colombo and Kandy, and no other cases of the disease were reported. There was a small decrease to 203 in the number of cases of RABIES. Stray dogs destroyed numbered 106,462. SARCOPTIC MANGE in goats and cattle causes losses when the animals are debilitated by shortage of food or bad weather conditions. A lime and sulphur dip is used for the goats. BOVINE PIROPLASMOSIS is enzootic, but severe cases are usually confined to the animals of European or Australian breeds. There were no outbreaks of PLEURO-PNEUMONIA of goats during the year. PSEUDO FOWL PEST [NEWCASTLE DISEASE] outbreaks occurred in many parts of Ceylon and, for the first time, an attempt was made to control an outbreak by application of available regulations (control of movement, sales, and markets). The results are said to have been encouraging. A disease of goats resembling HEARTWATER was investigated, but no definite conclusion could be drawn.

The virulent form of INFECTIOUS GASTRO-ENTERITIS of dogs was less prevalent. A case is recorded of AMOEBIC DYSENTERY in a dog. Parasites morphologically indistinguishable from *Entamoeba histolytica* were detected. Two young puppies were readily infected *per anum*. There is a description of the AEGYPTIANELLOSIS which occurs in Ceylon.

One dispensary was in operation during the year, 1,032 animals being treated. A small quarantine station was opened at Colombo for dealing with breeding cattle and goats imported from Indian and other Asiatic ports. The main function of the station is to allow of the importation of breeding stock without danger of introducing rinderpest to Ceylon.—J. A. GRIFFITHS.

COLONY & PROTECTORATE OF KENYA. (1939). **Annual Report of the Veterinary Department, 1938.** [DAUBNEY, R.] pp. 123. 8 plates, numerous tables, 3 graphs. Nairobi: Govt. Printer. [8vo] [Shs. 2/50].

GENERAL.—This report covers the first full year's working of the Department of Veterinary Services as an independent department and it opens with an interesting survey of the animal industry of Kenya and of departmental policy in relation to disease control and animal husbandry. The future of agriculture in Kenya and native nutritional problems also are closely bound up with the ability to develop a sound animal industry. Obstacles to progress are the continued existence of RINDERPEST and EAST COAST FEVER, the traditional conservatism of native peoples,

the scarcity of productive dairy animals, and the system of allowing squatter-owned stock to occupy valuable land, propagate tick-borne disease and thus hinder the introduction of improved stock. Sheep farming could be developed, but ticks must be reduced and helminth infestation controlled. Pig breeding will not keep pace with the dairy industry until some form of export has been arranged ; experimental shipments of bacon to England gave promising results. Pig keeping by natives is on the increase but *Cysticercus cellulosae* infection is already a menace.

Disease control remained the foremost need of the stock industry. Research on RINDERPEST goat virus has revealed a cheap and effective means of immunization. At the first Rinderpest Conference in Nairobi in February 1938, the opinion was expressed that the ultimate goal must be the complete eradication of the disease from East Africa and that this task should be capable of being achieved within a reasonable time. The present plan envisaged the eradication of the disease from the whole of the Colony except the Northern Frontier district and certain of the northern native reserves in which a buffer zone of immune animals would be maintained.

In the field of animal husbandry, research into the question of acclimatization of European herds is needed. The most urgent need of native ranching is for additional water supplies enabling a better distribution of stock and introduction of large-scale schemes of rotational grazing.

ANIMAL DISEASES.

Settled Areas.—Fifty-nine outbreaks of RINDERPEST were reported. The veterinary staff carried out 103,856 double inoculations and 9,980 virus-vaccine inoculations. Outbreaks were often traced to illicit movement of cattle, but one large group of outbreaks originated from infected buffalo. Fifty-five fresh outbreaks of EAST COAST FEVER occurred in " clean areas " and 122 in other areas. No outbreak of CONTAGIOUS BOVINE PLEURO-PNEUMONIA occurred. Two cases of RABIES were reported. Poison baiting was continued. 161 outbreaks of BLACKLEG and 41 of ANTHRAX were recorded. The increase in these two diseases was only apparent and was due to a higher proportion of outbreaks being reported. There were 26 outbreaks of FOOT AND MOUTH DISEASE. The disease was mild except among calves. BRUCELLOSIS was responsible for considerable losses in some herds, but it was impossible to assess the degree or extent of infection. HORSE SICKNESS was much less prevalent than in 1937, only nine cases being reported. Annual vaccination in breeding districts is practised. Sporadic cases of ULCERATIVE and EPIZOOTIC LYMPHANGITIS occurred. There were five reported outbreaks of EAST AFRICAN SWINE FEVER and mortality was usually heavy. Several cases of HAEMATURIA in cattle were diagnosed ; the cause is unknown, but improvement follows the regular administration of ground coral rock. A variety of other diseases was noted and they are enumerated.

Native Reserves.—RINDERPEST occurred in almost all native reserves ; 47,607 double inoculations and 29,274 vaccinations were carried out. The position with regard to CONTAGIOUS BOVINE PLEURO-PNEUMONIA improved considerably during the year. In the Masai district there were signs of approaching freedom from infection and the South Kavirondo outbreak was well in hand. Less success had been obtained with the Samburu reserve where some opposition to vaccination was experienced. No serious extensions of TRYPANOSOMIASIS were noted. FOOT AND MOUTH DISEASE was less prevalent than in 1937. Numerous sporadic cases of BLACKLEG were reported. Vaccination was becoming increasingly popular. Sporadic cases of ANTHRAX occurred but no serious outbreak was noted. Only one case of RABIES was confirmed. Little change occurred in the EAST COAST FEVER position.

RESEARCH.—The demand for sera and vaccines was very heavy throughout the year and the volume of routine diagnosis work was also large. Research was hampered by lack of staff.

The Kabete RINDERPEST goat virus reached its 240th passage and continued to fall in virulence for cattle during the year. The use of goat virus with a small dose (30 c.c.) of serum was unsatisfactory as some cattle failed to react and later became susceptible. One hundred cattle were inoculated with 5 c.c. of formolized vaccine, followed 14 days later by 2 c.c. of a 1 % suspension of goat spleen in saline. Eighty-five reacted and were immunized, while three were resistant to any virus. Nine failed to react and were still susceptible to bovine virus, while three were doubtful reactors. In a similar experiment performed on native cattle, 39 out of 55 susceptible cattle reacted to the goat virus and were immunized. Eight or ten of the cattle were not immunized by the vaccine-virus treatment. Neither the goat virus-serum nor goat vaccine-virus methods were sufficiently reliable to justify continued use as a field method for producing a durable immunity, but tests with a fresh strain of goat virus suggested that it would be possible to use goat virus alone. Passage of the Muktesar strain was discontinued. Encouraging results were obtained with a strain recovered from cases of rinderpest in vaccinated cattle. This had reached its 90th goat passage and was avirulent for cattle. Trials with desiccation of spleen virus in a Cryochem desiccator gave very satisfactory results and it was possible to prepare batches of goat virus from spleens of several animals and to issue a product of standard minimum titre ready for inoculation. A small experiment suggested that the inoculation of a large dose of hyperimmune serum delays the appearance of immunity from vaccine inoculation. A preliminary study of the results of drying various viruses and bacteria in the Cryochem apparatus was made. The virus of Nairobi sheep disease kept better as dried infected spleen than as dried infected blood. The organism of CONTAGIOUS BOVINE PLEURO-PNEUMONIA was viable in dried lymph for three months only. *Brucella* cultures stood drying well, being viable after 12 months' storage.

Successful transmission experiments were made in EPIDIDYMITIS in bulls associated with VAGINITIS in female stock. The cause of this disease has not been discovered, though much valuable negative information has been obtained.

Surveys of tsetse-fly areas were carried out; tests of trapping methods and of various " scent-baits " were made.

Observations on the periodicity and duration of oestrus in the ewe and cow, and experimental work on artificial insemination, were continued at the Experimental Station, Naivasha. The practice of artificial insemination was gaining ground rapidly among cattle farmers. 113 pregnancy diagnosis tests were carried out on 89 mares.—H. E. HARBOUR.

UNITED STATES OF AMERICA. (1939). **Report of the Veterinary Division, U.S. Army, 1939.**—*Rep. Surg. Gen. U.S. Army, 1939.* pp. 203–243. 13 tables, 1 chart.

PERSONNEL.—There was no change during the year in the authorized strength of 126. An increasing demand occurred for veterinary service in meat and dairy products inspection; owing to lack of personnel this work was hampered.

INSTRUCTION AND TRAINING.—Eleven officers received special training during the year, five at the Army Veterinary School, five at the Medical Field Service School and one at the University of Kentucky.

LABORATORY SERVICE.—The laboratory at the Army Medical Centre made provision for the production of equine encephalomyelitis vaccine.

ANIMAL MORBIDITY AND MORTALITY.—The average animal strength for the year was 24,238. The animal losses for the year are given in detail. There was a total of 40 cases of encephalomyelitis, with 16 deaths.—F. T. BOYLE.

UNITED STATES OF AMERICA. (1937). **Report of Division of Animal Industry, Department of Agriculture, California, 1936.** [DUCKWORTH, C. U.]—*Rep. Calif. Dep. Agric. 1936.* pp. 411–424. 2 figs.

The Federal-State Co-operative programme against bovine TB. was continued in 24 counties and the Federal Jones-Connally (voluntary) plan [also for TB. control] was extended to include 27 counties. During the year 423,272 cattle were tuberculin tested and of these 6,244 animals (1·5%) reacted. During the year several additional cities and counties adopted ordinances placing restrictions on the sale of edible dairy products from cattle which have not been tuberculin tested. A list is given showing the status of the counties of California with regard to TB. eradication.

Tuberculin testing in accordance with the pure milk provisions of the law was conducted regularly in counties which are not TB. controlled areas, and out of 7,606 cattle tested, 91 reacted.

Under the Federal-State Accredited Plan 51 herds, comprising 6,530 animals, were tuberculin tested.

The BRUCELLOSIS control plan was not changed during the year, at the end of which 409 herds, comprising 30,489 cattle, were under the plan. Certificates have been issued for 118 herds ; 18 of these qualified during the year under consideration.

EQUINE ENCEPHALOMYELITIS was reported late in the summer from several localities in the San Joaquin Valley.

Other diseases dealt with in the report are TEXAS FEVER, CHORIOPTIC MANGE, and MYCOTIC STOMATITIS in cattle, VESICULAR EXANTHEMA of swine (which occurred in the spring for the fifth successive year) and ANTHRAX.

The work being carried out at the General Pathology Laboratory, Sacramento, the Poultry Pathological Laboratory, Los Angeles, and the Poultry Laboratories at Petaluma and at San Diego is fully described.—F. T. BOYLE.

UNITED STATES OF AMERICA. (1938). **Report of Division of Animal Industry, Department of Agriculture, California, 1937.** [DUCKWORTH, C. U.]—*Rep. Calif. Dep. Agric. 1937.* pp. 359–373. 2 figs.

TUBERCULOSIS.—During the year 1,530,018 cattle were tuberculin tested, the number of reactors being 42,605. The most marked accomplishment during the year was the designation of 27 counties as modified accredited TB.-free areas. Forty-six entire states are now " modified accredited " *i.e.*, the infection is 0·5–1 %.

1,094 milch cows were tested during the year with one reaction.

Reports are submitted from meat inspectors at abattoirs in all cases of TB. found in animals other than those which have reacted to official tuberculin tests. During the year, 2,317 such reports were received concerning cattle, of which 506 were investigated and 1,140 reports regarding swine, of which none was investigated.

BRUCELLA INFECTION.—During the year 62 herds consisting of 4,512 animals were added to the control programme. Nineteen herds qualified for " Bang's disease "-free certificates. The plan now includes 328 herds comprising 23,235 cattle and 119 certificates have been issued to herds classed as free. Another programme under way is the project undertaken by the Federal department consisting of the vaccination of calves in certain herds. In this work, which is of an experimental nature, strain 19 is used for vaccination. At present 600 calves have been vaccinated.

SWINE FEVER.—A new law has been passed providing that swine imported for feeding or breeding must be accompanied by health certificates from veterinarians or livestock sanitary officials showing them to have been immunized against S.F. by either serum alone or by serum and virus. The law also provides for the licensing of sale yards for swine. The restrictions relative to importations of hogs into the state have resulted in a sharp decline in the number of pigs imported.

LAMBING PARALYSIS.—Evidence from field trials indicates that sugar can be used with success both in prevention and treatment of the disease.

Other diseases dealt with in the report are ANTHRAX, TEXAS FEVER of cattle, SWINE ERYSIPELAS, INTESTINAL FLUKE infestation and EQUINE ENCEPHALOMYELITIS, which was again prevalent in many parts of the state during the summer and autumn.

A description of the work of inspection and quarantine at frontier posts is given and also that of the work carried out at the General Pathological Laboratory and at the Poultry Pathological Laboratory.—F. T. BOYLE.

UNITED STATES OF AMERICA. (1939). **Report of the Division of Veterinary Science, Michigan State College of Agriculture and Applied Science, East Lansing, 1939.** [GILTNER, W.] pp. 51. Numerous tables, 4 plans, 1 photograph. East Lansing, Mich.: Michigan State College. [8vo].

There were 303 students enrolled during the year, including ten women students. There is a proposal to discontinue the pre-veterinary class in the veterinary division. The veterinary curriculum is a four-year course of study. The veterinary hospital building has been remodelled. An outbreak of water-borne *Brucella melitensis* infection affecting 80 students and others occurred in the bacteriology building. A fault was demonstrated in the technique of the sterilization of discarded *B. melitensis* cultures, and inadequate and faulty plumbing was found in which siphonage could be produced from the point where the contaminated glass-ware was washed.

The hospital treated 10,387 animals and birds; 3,017 as in-patients and 7,370 ambulatory cases. The extension specialist dealt with the control of BRUCELLA INFECTION, horse parasites and other diseases of farm animals (particularly MASTITIS and TRICHOMONIASIS of bovines and EQUINE ENCEPHALOMYELITIS) in the state of Michigan. During the year ending November 1938, in carrying out brucellosis control, blood tests were applied under federal supervision to 27,808 herds totalling 251,895 cattle. The reactors numbered 8,477 and suspects 3,328. Together these represented 4·7% of the cattle tested. There are 7,312 herds accredited as free from brucellosis, an increase of 2,729 over the previous year. In the control of mastitis, of 7,717 samples tested for streptococci, 25·5% were positive and a further 10% doubtful.—J. A. GRIFFITHS.

BOOK REVIEW

FEARON, W. R. [M.A., Sc.D., M.B., F.I.C., Fellow of Trinity College, Dublin, Member of the Royal Fisher Academy]. (1940). **An Introduction to Biochemistry.** pp. xii + 475. Numerous tables. [Numerous refs.] London: William Heinemann (Medical Books) Ltd. [2nd Edit.] [8vo] [17s. 6d.]

This second edition of an "Introduction to Biochemistry", first published in 1934, has to a large extent been rewritten. With the rapid advance in knowledge, whole chapters are now devoted to solutions and colloidal systems; steroids,

pigments, including pyrrole derivatives, carotenoids and flavins ; tissue respiration, and internal environment (mainly an elementary consideration of blood chemistry). Various new analytical methods are described, especially some recent micro-methods in blood analysis. In the preface to the original edition the author sought " to approach the living organism . . . along the less worn path of inorganic biochemistry " and omitted " much in the way of organic biochemistry ". The same line of treatment has been followed in the current edition, revised in the light of more recent knowledge. Part I is devoted to inorganic biochemistry while Part II, the section on organic biochemistry, follows the more conventional path in the treatment in turn of carbohydrates, proteins, lipides, steroids, pigments, nutrients (*i.e.* food requirements and vitamins), digestion, intermediate metabolism, tissue respiration, purines, nitrogenous bases, urea, excretion, hormones and the internal environment. A previous acquaintanceship with the principles of organic chemistry is tacitly assumed.

Assuming that this book is written for the beginner in biochemistry, the main criticism against it is the extremely condensed and concentrated treatment of the subject matter. The author's aim, it would appear, has been to cram the maximum number of facts into the minimal space and one feels that the average student will find the book at first rather heavy going. For revision purposes, the systematic cataloguing of the main facts should prove ideal. Several chapters contain detailed references of practical experiments but the inclusion of these tests and of certain micro-analytical methods has not been made universal throughout the book and it would probably have been better to have omitted details altogether of practical work, referring the student wholly to one of the excellent practical textbooks already available. Finally, in a work of such modest dimensions where " much in the way of organic biochemistry " has been omitted, a full discussion of theories of the structural formula of urea, including that of WERNER, seems somewhat out of place.

These criticisms apart, however, the average reader of the *Veterinary Bulletin* will do well to remember that he will find in the book an amazing array of facts, arranged methodically and concisely, many of which are still available only in the original literature. This applies, in particular, to Section I where concise and up-to-date information can be obtained on the inorganic (including " trace ") elements. Cross-references to other books and original publications are also given at the end of each chapter.

The printing, binding, exposition of formulae and diagrams are all excellent.

—ALFRED EDEN.

INDEX VETERINARIUS

The publication of *Index Veterinarius* commenced with the indexing of the literature of 1933. It is a complete index of current publications relating to veterinary research, public health, administration, education and other aspects of veterinary science.

The latest list of the publications indexed for this purpose was included in *Index Veterinarius*, Vol. 6, No. 1 (issued December, 1938) and also circulated with the *Veterinary Bulletin*, Vol. 9, No. 1.

About 10,000 references are indexed each year, each reference being suitably cross-indexed alphabetically under subjects and under names of authors.

As each half-yearly issue consists of a single complete alphabetical index of subjects and authors' names, a search through it involves a minimum of trouble, and all information required is readily found.

Each number contains the indexing done by the Bureau during the previous half-year, *i.e.*, No. 1, issued in December, covers the indexing done during the previous January to June.

The dates of issue of the two numbers of each volume are as follows:—

No. 1.—Issued December. Indexing period previous January—June.
No. 2.—Issued June. Indexing period previous July—December.

Vols. 1 to 3 (1933, 1934 and 1935) of the Index were produced on a duplicator; from Vol. 4 onwards it has been printed.

Vols. 1 to 5 were issued in quarterly parts; the issue is now half-yearly.

Annual Subscription, £5.

A limited number of copies printed on one side only are available for those who wish to mount references on cards.

Orders may be sent to:—

IMPERIAL BUREAU OF ANIMAL HEALTH,
NEW HAW, WEYBRIDGE,
SURREY, ENGLAND.

Imperial Bureau of Dairy Science

Shinfield, Reading, England

DAIRY SCIENCE ABSTRACTS

A comprehensive collection of abstracts of current literature dealing with milk and dairy products: husbandry, technology, control and standards, economics, physiology, bacteriology and mycology, chemistry and physics. Published quarterly. Subscription 25s. per volume of 4 numbers (5s. discount to British subjects who subscribe direct): single copies, 7s. 6d.

Technical Communications

No. 1. The phosphatase test for control of efficiency of pasteurisation. H. D. Kay, R. Aschaffenburg and F. K. Neave. Price 2s. (postage 2d. extra).

Imperial Bureau of Animal Nutrition

Rowett Institute, Aberdeen, Scotland

NUTRITION ABSTRACTS AND REVIEWS

Consists of abstracts of papers published throughout the world dealing with the subject of nutrition in all its aspects. They are arranged under the following sections: technique (including chemical and experimental methods), composition of food, physiology of nutrition, human diet in relation to health and disease (including dietary studies, food economics, deficiency diseases and therapeutic dietetics), feeding of animals and book reviews. Each issue also contains a review article on some subject of general interest.

Published quarterly. Annual subscription 42s.

Technical Communications

These are published at irregular intervals, price 1s.

Imperial Bureau of Animal Breeding and Genetics

King's Buildings, University of Edinburgh

ANIMAL BREEDING ABSTRACTS

This journal contains abstracts and reviews of current publications bearing on animal breeding, genetics, production, sex physiology, reproduction and cognate subjects. Published quarterly. Subscription rate, 25s. per annum.

Occasional Communications and *Bibliographies* are also issued from time to time.

Imperial Bureau of Pastures and Forage Crops

Agricultural Buildings, Alexandra Road, Aberystwyth

This Bureau covers current literature on grassland, forage crops and plant biological research, and issues two quarterly publications:—

HERBAGE ABSTRACTS and HERBAGE REVIEWS

The latter publication contains original articles and reviews on topics which merit more detailed consideration than can be given in the former.

Subscription rates: *HERBAGE ABSTRACTS.* 25s. per annum (single parts, 7s.).
HERBAGE REVIEWS. 15s.* per annum (single parts, 4s.).

*A reduction of 5s. will be made when *HERBAGE ABSTRACTS* is also ordered.

At irregular intervals larger monographs are published on miscellaneous subjects in the form of *Bulletins*.

Printed in Great Britain by H. R. Grubb, Ltd., Croydon.